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专业学位硕士学位论文

Urban Design Strategies for Slow Traffic Concept in the Context of Urban Renewal --Take Guangzhou Racecourse plot as an Example

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摘 要

随着中国城市化进程的加速，城市设计策略对于满足居民对城市出行品质需求日益显得至关重要。在存量开发时代，城市更新已逐渐成为推动城市发展的关键力量。近年来，广州积极采用高标准、高效率、高品质的方法全力推进城市更新行动，致力于打造高质量发展的新引擎。慢行交通理念，作为现代城市生活的主旋律之一，得到了越来越多的关注。人们渴望建设兼具城市生态景观走廊、健身、步行、休闲等多功能的慢行交通系统。因此，研究慢行交通理念在城市更新背景下的城市设计策略具有重要的实践意义和理论价值。在新增建设用地规模逐步减少的情况下，城市更新和慢行交通的相互融合成为推动中国城市化发展的重要途径。

慢行交通是城市交通系统的重要组成，以步行、自行车为主体。慢行交通的地位深受机动化进程影响，在机动化未普及时仅有步行出行形式，在机动化兴起时小汽车交通逐步取代慢行交通成为主导的交通形态，后机动化时期慢行交通重新受到重视，与公共交通配合成为推崇的出行方式。

赛马场地块位于广州珠江新城 CBD，是广州慢行需求最为旺盛的区域，这里高强度的土地开发规模和高密度的人员分布情况，直接对其慢行系统的设计从规模到品质上均提出了更高要求。赛马场地块作为广州珠江新城目前最大的闲置用地，以慢行为理念的城市设计对提升广州城市更新品质，活跃赛马场地块城市经济等有着重要意义。

本论文一共分为七章。第一章为绪论，阐释了本研究的背景、目的和意义，确了本文的研究方法与技术路线。第二章对城市更新背景和慢行交通相关理论进行了梳理和综述，并总结了城市更新和慢行交通的关系。第三章以赛马场地块为例进行实证研究，梳理了赛马场地块及其周边的交通现状，对赛马场地块及其周边城市环境、慢行现状和慢行人群进行调研，并对赛马场地块存在的问题进行总结。第四章结合前文对赛马场地块存在的问题总结，寻找中国与西方国家的针对性案例进行学习和研究。第五章结合前文案例学习，总结出慢行交通理念的城市设计的策略，并探讨其在赛马场地块的设计可行性。第六章为具体设计策略应用和设计内容展示，提出较为完整的赛马场地块城市设计方案。最后第七章，首先梳理了相关的研究成果，其次说明了研究成果存在的不足之处，以及对未来研究的展望。

本文有以下两点研究成果：其一是总结了赛马场地块及其周边慢行交通现状和现存问题；其二是提出城市更新背景下以慢行交通为理念的城市设计策略，并将其运用至赛马场地块城市设计实践。

关键词：慢行交通理念；城市设计；城市更新；

ABSTRACT

As the pace of urbanization in China accelerates, urban design strategies are becoming increasingly crucial in meeting the growing demands for high-quality slow traffic systems. In the era of stock development, urban renewal has gradually become a key driving force for urban development. In recent years, Guangzhou has been actively implementing urban renewal actions with high standards, high efficiency, and high quality, striving to create a new engine for high-quality development. The concept of slow traffic, as one of the main themes of modern urban life, has gained increasing attention. People are eager to build slow traffic systems that integrate urban ecological landscape corridors, fitness, walking, leisure, and other functions. Therefore, researching urban design strategies based on the slow traffic concept under the context of urban renewal holds significant practical and theoretical value. As the scale of new construction land gradually decreases, the integration of urban renewal and slow traffic has become an important pathway to promote the development of urbanization in China.

Slow traffic is an important component of the urban transport system, with walking and cycling as the mainstay. The status of slow traffic is heavily influenced by the process of motorisation, with walking being the only form of travel when motorisation was not widespread, car traffic gradually replacing slow traffic as the dominant form of transport during the rise of motorisation, and slow traffic regaining importance in the post-motorisation period, becoming the favoured mode of travel in conjunction with public transport.

The Racecourse plot is located in the CBD of Guangzhou's Zhujiang New Town, an area with the strongest demand for slow traffic. The high intensity of land development and the high density of people in the area directly demand a higher level of design for the slow traffic system, from scale to quality. As the largest vacant plot of land in Guangzhou's Zhujiang New Town, the urban design of the Racecourse plot is of great significance in enhancing the quality of Guangzhou's urban renewal and revitalising the urban economy of the Racecourse plot.

This thesis is divided into seven chapters. Chapter 1 is the introduction, which explains the background, purpose and significance of this study, and defines the research methodology and technical approach of this thesis. Chapter 2 provides an overview of the theories related to urban renewal and slow traffic, and summarises the relationship between urban renewal and slow traffic. Chapter 3 takes the Racecourse plot as an example to conduct an empirical study. The current traffic situation of the Racecourse plot and its surroundings is sorted out, and the current urban environment, slow traffic situation and slow traffic population in the Racecourse plot and its surroundings are investigated, and the problems of the Racecourse plot are summarised. Chapter 4 combines the previous summary of the problems of the Racecourse plot with a search for targeted case studies in China and Western countries for study and research. Chapter 5 summarises the urban design strategies for the slow traffic concept combined with the previous case studies, and also explores the feasibility of its design for the Racecourse plot. Chapter 6 shows the implementation of specific design strategies and presentation of design contents, and proposes a comprehensive urban design scheme for the Racecourse plot. Finally, in Chapter 7, firstly, the research results are reviewed, and secondly, the deficiencies of the research results are explained, as well as the prospects for future research.

This thesis presents two findings: firstly, it summarises the current situation and existing problems of slow traffic in and around the Racecourse plot; secondly, it proposes an urban design strategy based on the concept of slow traffic in the context of urban renewal, and applies it to the urban design practice of the Racecourse plot.

Keywords: slow traffic concept; urban design; urban renewal;

目录

Chapter 1: Introduction

1.1 Background

1.1.1 Research Background

At present, China's urban development has shifted from the era of incremental development to the era of stock renewal. As China's urban development and construction now encompass both stock and increment, urban renewal has become an essential requirement for the transformation of urban development and construction. It is an indispensable part of spatial planning. This naturally includes the renewal and design of the urban transport system, especially for the urban centre, where the construction and development of the transport system has already entered the stage of stock development, and how to promote the quality of the urban area by optimising the function of the urban streets and the slow traffic spatial environment has become the focus of current research. The improvement of slow traffic needs to take into account the scale of the urban area, the spatial layout and the external natural geography and other environmental factors, to achieve a harmonious symbiosis between slow traffic, rapid transit, rail transit, public infrastructure and buildings, etc.; it also needs to consider the demand of urban residents for slow traffic and their desire to improve the quality of the slow traffic environment, which makes it necessary, systematic and complex to study slow traffic in the context of urban regeneration. This makes the study of slow traffic in the context of urban renewal more necessary, systematic and complex, and requires a deeper discussion on the issue of urban slow traffic system in the context of urban renewal. As a low-carbon, healthy and environmentally friendly mode of transport, slow traffic has been gaining more and more attention from countries around the world. The call for prioritising public transport and encouraging slow travel is gaining momentum. Therefore, urban design based on the concept of slow traffic is imperative to improve the quality of walking and cycling, to ensure travel safety and to create a better urban environment.

As one of the fastest growing cities in China, Guangzhou's urban renewal work has always

been at the forefront of China. In recent years, Guangzhou has fully implemented urban renewal actions with high standards, high efficiency and high quality[1].As the center of Guangzhou city in the new century, Zhujiang New Town is the main part of Guangzhou Tianhe CBD. Tianhe CBD is one of the three state-level central business districts approved by the State Council. The Zhujiang New Town represents the latest achievement of Guangzhou's urban construction, but in the process of China's rapid urbanization, the Zhujiang New Town is also facing the problems of urban renewal.

The Guangzhou Racecourse, located in the north-eastern part of Guangzhou's Zhujiang New Town, was built in 1992 and officially opened in 1993. on 14 December 1999, the Guangzhou Racecourse, which had held 757 horse races, announced its closure. Later on, the former racecourse once became the largest automobile city in Guangzhou, but in 2013, the Racecourse General Corporation issued a notice of non-renewal of the lease contract of the automobile city, stating that the company would not renew the contract with the operators after its expiry on 31 December 2013; from 1 April 2014, the automobile city would be completely closed and the water and electricity supply would be stopped. Since then, the Racecourse plot has basically been in a near-deserted state. The current Racecourse plot facility is single, unable to provide more urban living fun for the public, which is extremely inconsistent with the urban construction and urban image of Guangzhou's Zhujiang New Town. It is also contrary to the goal of Guangzhou's urban renewal to pursue high-quality slow-moving urban quality.

This thesis takes the concept of urban slow-moving traffic as the research object and urban regeneration as the background. Based on the current research status and key theoretical and methodological systems in China and western countries, it conducts a targeted study on the urban design strategy of the Zhujiang New Town Racecourse plot in the urban centre of Guangzhou with the concept of slow-moving traffic, and carries out an empirical study and

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design practice with the Zhujiang New Town Racecourse plot in Guangzhou as an example, aiming to provide some theoretical support and methodological guidelines for the urban design of slow-moving traffic concept in China in the context of urban renewal stock planning.

1.2 Research aims and objectives

1.2.1 Research aims

The aims of this research are to explore how the concept of slow traffic can be incorporated into urban design strategies during urban renewal in order to achieve sustainable development of the Guangzhou Racecourse plot. Using the Guangzhou Racecourse plot as a specific case scenario, this research aims to:

1. This research aims to improve the urban quality of the Guangzhou Racecourse plot and achieve sustainable development of urban space, while providing theoretical guidance and practical experience for similar urban renewal and urban design projects.

2. In-depth understanding of the connotation of the slow-moving concept and its value in urban design: through the research of the slow-moving concept, the importance of its contribution in urban design, such as enhancing livability, promoting sustainable development and improving the quality of life of residents, is clarified.

3. Exploring the implementation strategies of the slow-moving concept in the context of urban renewal: analysing the problems and challenges in the process of urban renewal, exploring how to integrate the slow-moving concept in urban renewal, and proposing specific urban design strategies to achieve a harmonious coexistence of slow-moving traffic and urban space.

4. Combining the characteristics and needs of the Guangzhou Racecourse plot, to propose an operational urban design strategy for the slow traffic concept, in order to promote the sustainable development of the Guangzhou Racecourse plot in the urban renewal process. To

provide reference urban design concepts and methods: to provide urban planners, designers and decision-makers with theoretical basis and practical methods for the urban design strategy of the slow-moving concept to guide the implementation of other similar urban regeneration projects.

5. Promoting theoretical innovation and practical exploration in the field of urban planning and design: Through the research of urban design strategies for slow-moving concepts in the context of urban renewal, it will promote theoretical innovation and practical exploration in the field of urban planning and design, and provide new concepts and methods for sustainable urban development.

1.2.1 Research objectsives

The main objectives of this thesis research are as follows：

（1）Slow Traffic Concept :

The slow traffic Concept emphasises a human-centred approach and promotes low-speed, green modes of travel such as walking and cycling. This study will explore how the slow traffic concept can be integrated into urban design strategies to achieve a more liveable and sustainable urban environment.

（2）Urban Design Strategies for the Slow Traffic Concept:

The research will take a closer look at how the slow traffic concept can be integrated into urban design strategies to achieve a more liveable and sustainable urban environment. A comprehensive review of existing urban design strategies and practices will be undertaken to analyse the problems and shortcomings, and to propose a series of new, integrated urban design strategies guided by the slow-moving concept. These strategies will focus on various aspects such as improving the quality of urban space, optimising the transport layout, preserving historical and cultural heritage, and enhancing green infrastructure. Through these strategies, the aim is to humanise, ecologise and sustain urban space, making the city more responsive to people's needs and expectations in the renewal process and stock development.

（3）Design Practice：

Combining the case studies of urban design for slow traffic and the research of design strategies, an urban design scheme with slow traffic as a strategy is proposed for the Guangzhou Racecourse plot for practical research.

1.3 Research significance

In modern urban development, urban renewal has become an important way to promote sustainable urban development, and slow traffic (e.g. walking and cycling trips) is receiving increasing attention from urban planners and residents as an environmentally friendly, healthy and sustainable way to travel. In this context, it is of great significance to research the urban design strategy of the slow-moving concept to promote sustainable urban development.

1.3.1 Theoretical significance

The significance of this thesis is to explore how the concept of slow traffic and urban design strategies can be applied in the context of urban renewal, taking the Guangzhou Racecourse plot as an example for an in-depth study. The findings of the study have important practical implications for promoting sustainable urban development, improving the quality of life of urban residents, and enhancing the quality and efficiency of urban regeneration. The study also provides useful references for other urban renewal projects.

1.3.2 Practical significance

1. Improving the quality of life of urban residents: By researching the slow-moving concept urban design strategies can effectively improve the travel experience of urban residents, reduce traffic congestion, reduce air pollution and improve the quality of life of urban residents.Improving the quality of life of urban residents: By researching the slow-moving concept urban design strategies can effectively improve the travel experience of urban

residents, reduce traffic congestion, reduce air pollution and improve the quality of life of urban residents.

2. Optimising the spatial layout and functions of the city: Researching urban design strategies for the slow-moving concept can help urban planners optimise the spatial layout of the city and improve the rationality and diversity of urban functions, thus enhancing the overall competitiveness of the city.

3. Enriching the culture and character of cities: the slow-moving concept urban design strategy helps to preserve and pass on the city's history and culture, enhance the character and charm of the city, and improve its attractiveness and influence. By preserving historic districts, optimising landscape design and improving the quality of public spaces, the slow traffic Concept urban design strategy helps to showcase the unique charm and cultural heritage of the city, making it more vibrant and inclusive.

4. Introducing healthy modes of travel: The Slow Traffic Concept urban design strategy can improve the health and quality of life of residents by enhancing the convenience and comfort of slow travel modes such as walking and cycling, and leading them to adopt healthier modes of travel.

1.4 Research scope

1.4.1 Research scope

The Racecourse plot of land within the design scope of this research is located at 668 Huangpu Avenue West, Tianhe District, Guangzhou（Figure 1-1）, which is the northeastern part of Zhujiang New Town.It extends from Huangpu Avenue to the north, West to West Racecourse Road, East to Tamcun Road and South to North Racecourse Road, covering an area of 380,000 ㎡. Zhujiang New Town is located at the junction of Tianhe, Yuexiu and Haizhu districts, with the South China Express Line to the east, Guangzhou Avenue to the west, the Zhujiang River to the south and Huangpu Avenue to the north. It connects the

traditional business district of Yuexiu to the west and the eastern part of the district to be developed, and connects the southern group across the river. The total planned site area is 6.44 square kilometres, with a core area of approximately 1 square kilometre and a commercial building area of approximately 4.5 million square metres (Figure 1-2).

China Guang Dong Guangzhou Tianhe District

Figure 1-1 Location Map of Zhujiang New Town Resource: Self-drawn by the author

1.4.1 Design scope

Figure 1-2 The boundary of Zhujiang New Town Resource: Self-drawn by the author

The design scope is the Guangzhou Racecourse plot, which is located at 668 Huangpu Avenue West, i.e. the northeast of Zhujiang New Town in Guangzhou Tianhe District. It extends from Huangpu Avenue to the north, West to West Machang Road, East to Tamcun Road and South to North Machang Road, covering an area of 380,000m^2.(Figure 1-3)

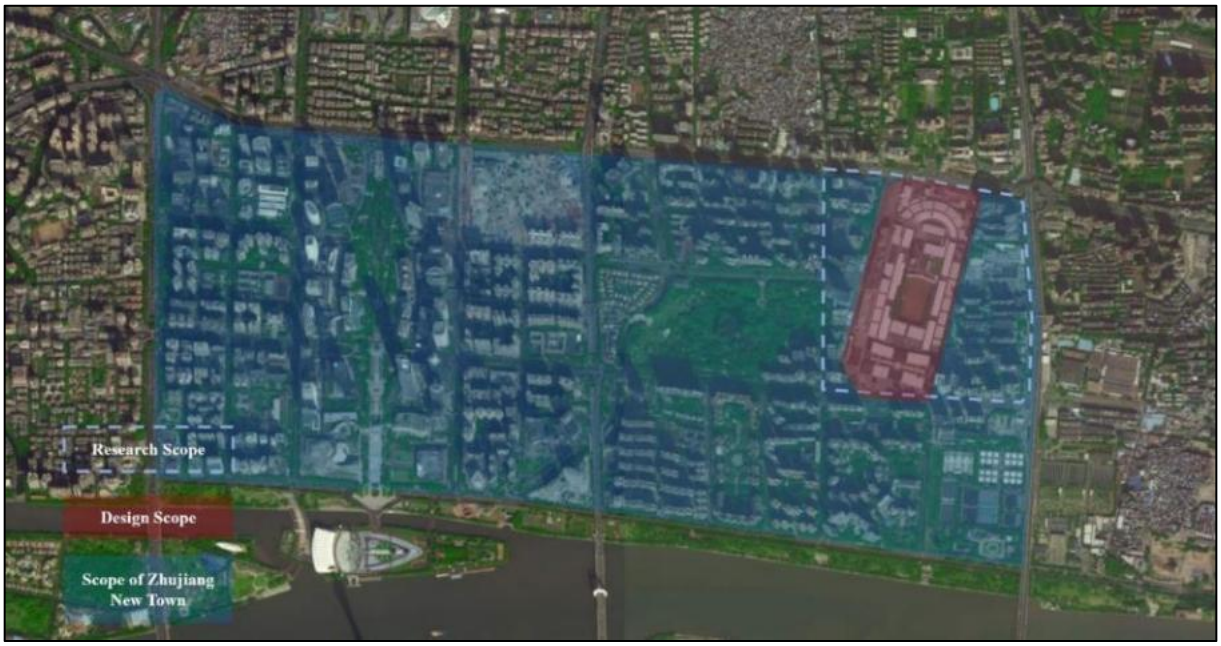


Figure 1-3:Scope of the design research Resource: made by the author

1.5 Research methods and research framework

1.5.1 Research methods

（1）Literature review

Read relevant literature from China and Western countries, study existing results and sort out the context as a basis for analysis and research. Through the collection and collation of literature on urban renewal and slow traffic, the current research progress in China and Western countries in this field is captured, and the more mature research results are drawn upon to lay the foundation for this research.

（2）Empirical investigation

A site survey was conducted at the Zhujiang New Town Racecourse in Guangzhou to obtain first-hand data and to comprehensively investigate the current situation of its slow walking system, as well as the current traffic situation around the Racecourse plot, and the current situation of the slow walking space to lay the foundation for the subsequent analysis and research.

（3）case studies

The case studies on the development of slow-moving systems in China and western countries are collected, and those similar to the urban positioning of the Zhujiang New Town Racecourse plot in Guangzhou are selected to summarise their construction background, current situation of slow-moving systems, successful experiences and planning and design strategies, and to gain insights into the experience of slow-moving traffic and urban design of the Racecourse plot in Guangzhou.

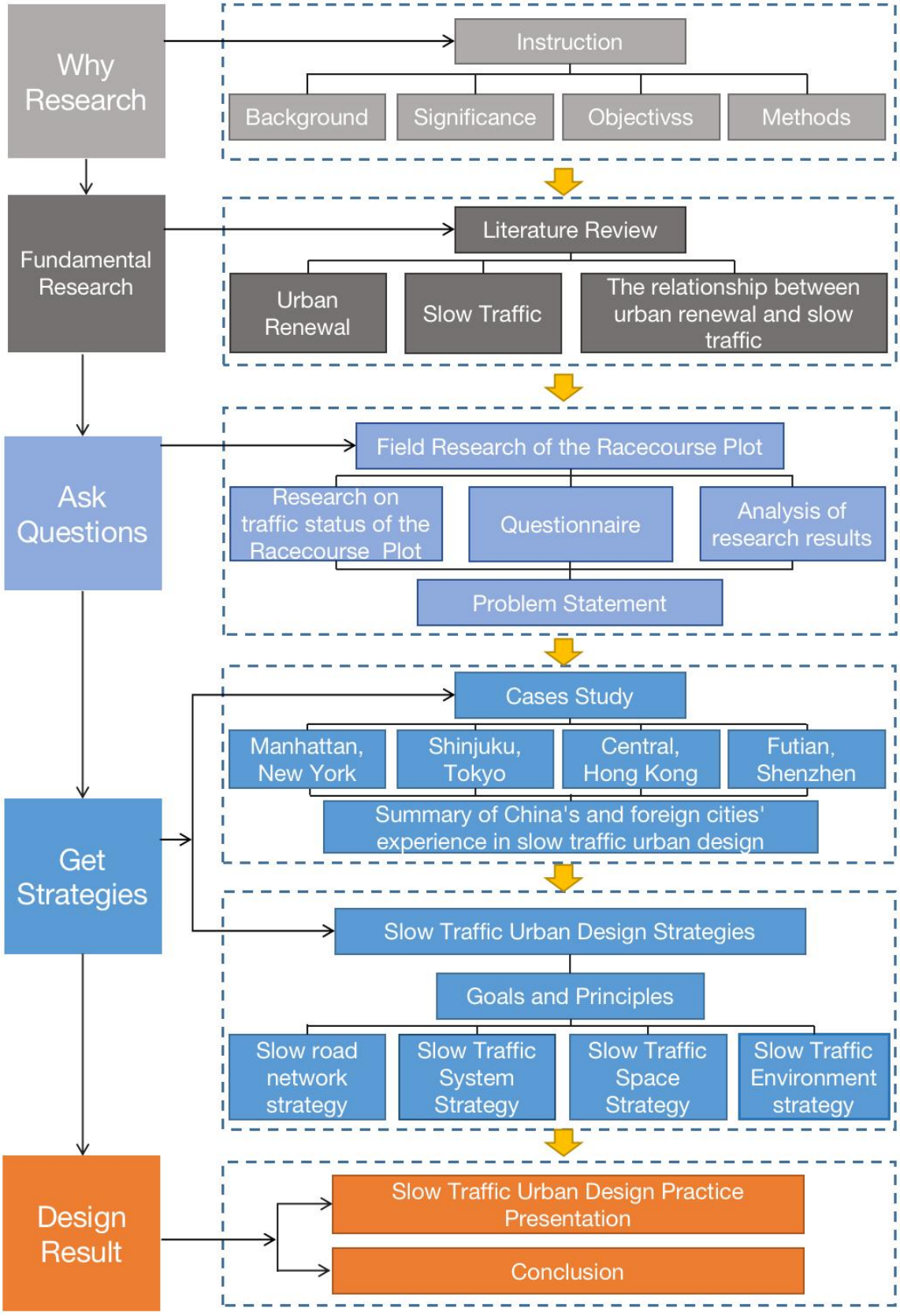
（4）Analysis and Synthesis

The basic information and practical cases collected are systematically analysed and collated to produce the findings of this thesis on the basis of analytical research.

（5）Design practice

Combining the case studies of urban design for slow traffic and the research of design strategies, an urban design scheme with slow traffic as a strategy is proposed for the Guangzhou Racecourse plot for practical research.

1.5.2 Research framework



Chapter 2: Literature Review

2.1 Urban renewal

Urban renewal originated from the large-scale urban reconstruction and renovation in the Westerns after World War II, and then a large number of scholars in Western countries conducted in-depth research on it. It mainly includes urban renewal concepts, policies and systems, and effectiveness evaluation.

2.1.1 The development of urban renewal theory

In early1898，Ebenezer put forward the theory of the "garden city" the main idea is to limit the continuous expansion of urbanisation[2]. The method is to establish a new "garden" city with limited population size. In 1989，Harvey proposed "urban entrepreneurialism", arguing that capital accumulation should be made for a more extended period[3]. The direction of urban development in the context of globalisation should be to develop competitive competitiveness. Robert and Sykes, in their 1999 study, argued that urban development can be enhanced by strengthening connections, social aspects, economic factors, and the necessary material conditions through the use of comprehensive methods[4]. In 2007, Hackworth introduced the concept of "The Neoliberal City," advocating for an expansion of government power instead of complete marketization. He emphasized the importance of policies that regulate and intervene in the market[5]. According to a 2009 research by Bramley and Power, sustainable urban development should prioritize people's interests and community growth. They also stressed that urban sustainability is closely linked to urban spaces[6].

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2.1.2 Urban renewal policies and systems

Carmon in 1999 summarized and comparatively analysed the policy content and characteristics of urban renewal in western countries and combined with three Israeli cases, summed up the experience and conclusions for reference[7]. In 2004 Priemus compared the urban renewal policies of four European countries: Britain, France, Denmark, and Sweden, and proposed that urban renewal legislation is not universally applicable, and urban renewal helps to promote urban employment and urban economy thereby improving urban competitiveness[8]. Durose & Lowndes studied urban renewal theories of neighbourhood renewal and community participation and pointed out that civil public participation should be brought into play, and the role of social networks should also be emphasised in 2004[9]. As far as the method of urban renewal is concerned, the method and strategy of urban renewal have changed from single real estate development to industrial upgrading, building large-scale retail shopping centres, and holding cultural and sports activities and events (Ilka et al., 1997; Several et al. ., 2007)[10][11]. In recent years, urban renewal practice has paid more attention to social mobilisation, community participation, public participation and neighbourhood renewal, advocated the use of civil power, and paid attention to the role of local community leaders and NGOs in the process of urban renewal, and explored the role of various interest groups in the city in the process of urban renewal. Power distribution in “top-down” and “bottom-up” urban renewal (Rossi, 2004; Hemphill et al., 2004; Durose et al., 2010)[12][13][14].

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2.1.3 Evaluation of the effectiveness of urban renewal

Scholars usually use cost-benefit analysis method, fuzzy evaluation method, analytic hierarchy process, questionnaire survey method and other methods to study the implementation effect of urban renewal. In 2004 Hemphill, McGreal & Berry established an urban renewal evaluation index system including social, economic, link, material and other aspects through the research on the evaluation index system of some cities[15]. In 2009, Silvia utilized Geographic Information Systems (GIS) to examine the involvement of the public in decision-making processes related to urban renewal[16]. In 2010 Rossini & Kupke took Australia as an example and used the benefit analysis method to evaluate its urban renewal projects[17]. In 2017 Grace & Edwin comprehensively used Delphi and AHP methods to evaluate the effectiveness of relevant urban renewal from three aspects: society, link and economy[18].

2.1.4 Guangzhou urban renewal development

Urban renewal is an important strategy for China's urban development during the 14th Five-Year Plan period, and is also a necessary path for sustainable urban development under the new normal. In recent years, Guangzhou has been implementing urban renewal initiatives with high efficiency and quality, actively building a new engine for high-quality development, and providing solid support for the new vitality of the old city[19].

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Guangzhou urban renewal began in 2009 with the "Three Olds" transformation policy and has undergone institutional reforms such as the "Three Olds" transformation office and the Urban Renewal Bureau[20]. In 2010, Guangzhou established the "Three Olds" Transformation Office, and in the same year prepared the "Guangzhou "Three Olds" Transformation Plan" and special plans for old cities, old factories and old villages, forming the "1+3+N"[21]. "Guangzhou "Three Olds" Transformation Plan" planning system based on three levels: macro, medium and micro, taking into account the overall and local characteristics. In June 2012, the "Supplementary Opinions on Accelerating the Transformation of the "Three Olds"" were issued, which put forward a series of new principles, such as planning first and continuous transformation, on the basis of adhering to the government-led approach. The adjusted policy has raised the threshold for renovation while at the same time making the motivation of the renovation body greatly affected. In 2015, Guangzhou established the first urban renewal agency in China, the Guangzhou Urban Renewal Bureau, and in December of the same year, issued the Guangzhou Urban Renewal Measures, which creatively introduced the "micro-renovation" urban renewal model[22]. In August 2020, the 11th Plenary Session of the 11th Municipal Committee considered and adopted the Implementation Opinions on Deepening Urban Renewal Work to Promote High-Quality Development and the Work Plan on Deepening Urban Renewal Work to Promote High-Quality Development, raising urban renewal to an unprecedented strategic height, making urban renewal an important engine for Guangzhou to promote high-quality development, and taking the lead in exploring a new path for systematic renewal of mega-cities to achieve high-quality development in China[23][24].

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2.2 Basic concept of urban slow traffic

2.2.1 Concept of urban slow traffic

The carrier that carries the slow traffic is the slow traffic system[25]. slow traffic, obviously, can also be understood as non-motorized traffic. Usually, the speed of slow traffic is no more than 15km/h. In this thesis, slow traffic basically refers to walking and bicycle traffic, and based on the expansion of the city, "walking + bicycle" travel mode is widely implemented, and the connection with public transportation, rapid transit, and transportation hubs is also part of slow traffic[26]. The slow traffic system is a general term for pedestrian and bicycle traffic and related supporting facilities, which has both urban transportation functions and carries the life functions of urban residents in terms of physical recreation, physical exercise and socialization[27].

2.2.2 Research direction of urban slow traffic

The most basic way of life for the inhabitants is walking, and even though airplanes, boats and automobiles have replaced the legs of people for rapid movement, walking is still the most basic and important mode of transportation in the act of transportation[28]，The policy tilt has led to unrestricted widening of lanes, compromised pedestrian rights-of-way, narrowing of sidewalks, construction of massive wide roads and highways, and separation of slow space systems. Since the 1960s, Western and Eastern academics have reflected on the rapid growth of the automobile and urban transportation planning and development policies of this period[29]. Calls for the restoration of healthy and livable urban life, and for the restoration and construction of slow-moving traffic systems. The integration of slow traffication systems with

[25] Yin Weiguo. Guangzhou's experience in urban greenway construction is worth promoting [N]. China Tourism News,2019-04-03(00).

[26] Chen Yuwan. Analysis of the spatial characteristics of urban slow walking system in the context of public transportation city and measures for its construction[D]. Harbin Institute of Technology, 2012.

[27] Yu Liyan. Exploration of slow traffic design[J]. Jiangsu Building Materials,2023(01):64-65.

[28] Luo, Linlin.Ecological compact city design for the future - additional thoughts on compact cities from the perspective of human ecology[J].Urban Architecture, 2016(36): 13-15.

[29] Mao Chen. Study on the optimization of the layout of urban slow transportation system facilities[D]. Nanjing Forestry University,2018.

the construction of urban public transportation systems has become an urgent issue to be studied and resolved[30].

2.3 Classification of urban slow traffic

2.3.1 Footpaths

The footpath network often traverses spaces and buildings with different conditions: arterial roads, mostly public, which allow pedestrians to walk and cross streets; public paths outside the road system, such as coastal or riverfront trails, paths in parks, and footpaths connected to other means of transport and parking areas； private land, such as spaces adjacent to private buildings and car parks. In these cases, an in-depth analysis of the complexity of the footpath network and the nature of the problem is first required[31]. It is important to recognise, understand and act from the outset to integrate and balance the needs of all trail users when developing a comprehensive specification for the construction of a new footpath or the upgrading of an existing one[32].

（1）Hierarchical order of road users

Roads should accommodate multiple types of users. The conflicting needs of the various users often require the necessary balance in terms of level of service, physical space, and enforcement restrictions. In some areas, the road user hierarchy is ordered from most to least important: (i) people on foot and those whose mobility is limited by the use of wheeled vehicles; (ii) disabled and infirm groups; (iii) cyclists; (iv) users of public transport systems; (v) commercial people (including transport and emergency vehicles); (vi) traffic-generating purchasers; (vii) traffic-generating tourists; and (viii) traffic-generating commuters[33].

[30] Shen Chan, Liu Minglin. A review of domestic and international slow traffic systems and their applications[J]. China Municipal Engineering,2015(04):12-15+97.

[31] Chen R. Discussion on the design of slow traffic in urban streets based on small blocks and dense road networks[J]. Municipal technology,2020,38(06):41-43+48.

[32] Su, Shujie, He, Lu. Research on the construction of a comprehensive evaluation system for urban pedestrian roads[J]. Informatization Construction,2016(03):329-330.

[33] Di Mengyuan. Research on the evolution of road traffic state of different levels in cities[D]. Beijing Jiaotong University,

（2）Footpaths off the main road

High quality pedestrian areas should be built in all new buildings as well as in urban renewal projects and, in general, new pedestrian areas should be in better condition than existing pedestrian areas.

（3）Footpaths within main roads

There are already footpaths on main roads and they still have many shortcomings from a pedestrian point of view. Factors influencing the solution: reduction in the volume of adjacent road traffic; reduction in the speed of traffic on adjacent roads, possibility of pedestrian space on main roads, best way to cross the road, possibility of walking on existing routes; opportunity to improve existing spaces, interaction with existing urban quality elements. Reduced traffic volumes and reduced traffic speeds are conditions that must be preferentially met, as they not only provide convenience for pedestrians, but also contribute to increased road safety, improved air quality, reduced noise pollution and lower infrastructure maintenance costs, while improving the living conditions of an area[34].

（4）Pedestrian environment

Urban and road infrastructures with pedestrian space conditions are strongly influenced by three factors: residential streets; pedestrian areas; and shared areas.

①Residential streets

A residential street is a road designed strictly for the community in which it resides and the interaction of its inhabitants. Features of a residential street include: traffic calming measures, landscaped buildings and plants and trees, places for social activities, children's play areas, seating and bar or restaurant terraces, improved lighting conditions, improved junctions

2020. DOI:10.26944/d.cnki.gbfju.2020.001712.

[34] Yin Bingcheng,Yu Shoujing. Classification of urban road grades at the complete street scale [C]// Academic Committee on Urban Traffic Planning, China Society of Urban Planning.Proceedings of the 2017 Annual Conference on Urban Traffic Planning in China. China Construction Industry Press,2017:639-647.

between roads and buildings. The concept of residential streets can be used for any urban road, but must be developed in a sequential manner according to specific conditions. As there is no single solution to the design of residential streets, it is important to consult the public in the process of identifying problems and assessing solutions. The advantages of residential streets include: improving security and pedestrian safety, increasing economic vitality, supporting community road networks, creating a sense of local belonging and identity, promoting cultural activities, increasing environmental sustainability, facilitating the use of on-site and service facilities, improving the image of the space and increasing social interaction. The main disadvantages of residential streets are the potential impact on motorised traffic and the high cost of redevelopment.

Figure 2-1 Residential street slow traffic area Image Source: https://sucai.redocn.com/jianzhu_8895477.html

②Pedestrian-only areas

Pedestrian-only areas largely require complete restriction or prohibition of vehicle access[35]. There are generally four types of pedestrian areas: converted pedestrian areas - closed streets for pedestrians only; plazas - closed blocks or urban areas, but the roads through the main area are still open to vehicular traffic. Continuous roads - more dispersed and with closed junctions; off-site footpaths - footpaths are not built on the usual roadside walkway locations, instead using the alleyways. Pedestrian-only areas work best in certain urban areas. These areas often include numerous offices and shops, where the use of motor vehicles is extremely inconvenient, and where motor traffic has sometimes been shifted to adjacent roads, and therefore have a high level of pedestrian activity. The pedestrian-only area allows access for emergency vehicles or for lorries to load and unload goods (often restricted to the early hours

[35] He Zhengjun. Research on road lighting in pedestrian commercial streets [D]. Chongqing University, 2003.

of the morning). Low-speed arterial roads reserved in the area can allow public transport. In most cases, the pedestrian only areas are bicycle-accessible[36]. The advantages of pedestrian-only areas include: creating optimal conditions for free walking activities and pedestrian safety; reducing pedestrian congestion, increasing access to retail activities, improving air quality and reducing noise pollution; increasing the economic efficiency of the commercial area and helping to improve the competitiveness of retail goods and their performance. The main disadvantages of pedestrian-only areas are: the creation of traffic problems; the unoccupied state at the end of commercial activities and the prohibition of bicycles in certain closed sections, which reduces the available parking space.

③Shared areas

Shared areas are at most times defined as residential streets or areas of retail commercial activity where residents and pedestrians have priority, and where the dominance of motor vehicles is largely diminished. Motor vehicles, including service vehicles, may enter the area, but must give way to pedestrians. Pedestrians must not obstruct the passage of motor vehicles and there is no boundary between the pavement and the carriageway[37]. The driveway is actually limited by many factors such as trees, shrubs and street furniture, reduced road width, changes in ground level elevation, and parking space, so that motor vehicles pass slower and have a reduced turning radius in these areas. As a result, such areas are not easily accessible to motor vehicles and access is restricted to specific vehicles when necessary. These factors significantly reduce the number of vehicles and ensure that drivers are more attentive to driving. Shared areas improve environmental conditions and road safety, bring convenience to residents and patrons of commercial activity areas, and provide open space for walking and playing. Shared areas are suitable for streets and areas where there is less demand for car traffic. The advantages of shared areas are: environmental improvements by improving air quality, reducing noise and enhancing the visual impact of the landscape; reduced traffic accident rates; increased social interaction and a greater sense of group identity to enhance

[36] Cui Yanquan. Study on the planning of slow walking system in waterfront area of cold cities[D]. Harbin Institute of Technology, 2013.

[37] Lv Minghua. Research on green ecology-oriented urban road cross-section layout[D]. Chang'an University,2015.

personal safety. The disadvantages of shared areas are: they can lead to traffic congestion in nearby streets; the cost of the interventions required can be high; and maintenance costs are higher than for driveways.

2.3.2 Bicycle paths

The bicycle path network consists of interconnecting roads and corresponding services. Possible locations for cycle paths include urban trunk roads; urban back streets; urban feeder roads; rural roads; disused railways; waterfront roads; coastal and sandy beaches; nature reserves and parks; other destinations; and public transport networks[38].

（1）Bicycle paths on urban expressways and main roads

Urban expressways and main roads are primarily used for transit traffic rather than as links to adjacent buildings. In order to be easily used by the majority of cyclists, these roads should provide the facilities and services required by cyclists. The advantages of main urban roads are that they are mostly used by cyclists and are easy to parallel and turn around. They should be designed to be as safe as possible. Most trunk roads often have a high degree of level with the adjacent local roads and are in good condition. Road junctions usually require traffic management facilities such as traffic lights to facilitate the smooth flow of traffic. They have fewer slip roads and lanes and are safer for professional cyclists. The disadvantages of main urban roads include: higher speeds and traffic volumes, which are not suitable for users with only basic cycling skills; and cyclists are more vulnerable to air pollution (e.g. from car exhaust); even with cycle lanes, these high-speed roads are still not suitable for children and beginners. Constraints to the provision of cycle lanes on main roads include insufficient space at junctions[39]； Need to maintain a standard number of off-street parking spaces; potential conflict with adjacent commercial areas.

[38] Yang Qiyao, Cai Jun, Huang Jianzhong. Research on the planning and design strategies of bicycle road networks for travel quality improvement[J]. Journal of Urban Planning,2019(06):72-80.DOI:10.16361/j.upf.201906009.

[39] Sun M.C.,Yang X.G.. Traffic space planning and design methods for urban road level intersections[J]. Urban Transportation,2006(03):47-52.

（2）Bicycle paths on city back street

Many cyclists prefer quiet routes when travelling between urban and suburban areas, especially if they wish to avoid traffic jams. Urban backstreets can meet this need if they are relatively uniform and continuous. Urban back streets will only be used by cyclists if they are as convenient as most through streets[40]. Therefore, urban backstreets must be built to the same standards of convenience and safety as parallel lanes on main roads, and should also be considered for the use of traffic calming measures and good signage. The advantages of urban back streets are that they form the basis of a road network, especially in older cities, and are suitable for the construction of cycle paths. There are more back streets than feeder roads and they do not take up additional land unless there are missing sections that prevent direct access to the street. Generally cyclists can reach almost all their destinations via these backstreets and enjoy a relaxed journey avoiding congested or dangerous main roads, so backstreets can also be used as recreational or tourist roads. The limitation of urban back streets is that they need to be made safer while being less expensive to build than main roads cannot easily achieve if they are to attract large numbers of cyclists. These side streets often have more junctions than main roads and the lanes and parked cars make them more dangerous and therefore require appropriate protective measures such as signalisation at the junctions of more congested streets.

（3）Bicycle paths on roads or green parks within the Eco-Park

The roads within the Eco-Park are completely isolated from the street and are generally located within the park or other internal areas. Advantages include: they are safer because there are no conflicts with motor vehicles, which means they are more attractive to beginner cyclists and are also relatively safe. These paths are generally located within landscaped spaces and are intended to enhance the quality of the urban environment, while being convenient for pedestrians and sports enthusiasts. They are more suitable for visitors to walk or ride for recreation. The disadvantage is that these paths still suffer from poor safety at night

[40] Xu Simin. How commercial real estate can do well in backstreet economy[J]. China Real Estate,2022(05):53-58.DOI:10.13562/j.china.real.estate.2022.05.012.

and during low-traffic periods. They should be well lit and well marked for ease of use. Signalisation is required and the design requirements are high. Areas such as nature parks and green parks are usually more popular with cyclists. Cycle paths in these areas are usually several kilometres long and are equipped with services to provide a good cycling experience.

（4）Other locations

Other potential locations for cycle paths and trails include protected areas and abandoned streets.

2.4 Elements and characteristics of urban slow traffic

2.4.1 Elements of urban slow traffic

The place where the slow traffic activity takes place, the person who emits the slow traffic activity and the slow traffic activity itself, all together form the slow traffic system, in other words, the slow traffic system consists of three key elements: the slow traffic space, the slow traffic subject and the slow traffic behaviour[41].

Slow space is the physical element of a slow-moving system. It consists of traffic and non-traffic slow space: traffic slow space refers to facilities for pedestrians or bicycles, such as pedestrian paths, overpasses, underpasses, bicycle paths, etc.[42]; while non-traffic slow space mainly consists of leisure and recreation space and commercial shopping space, such as green paths, waterfront trails, pedestrian shopping streets, etc.

The slow traffic subject is the element that implements the slow traffic system. It refers to the actors who carry out the relevant slow traffic activities. They can be divided into three categories according to the purpose of slow walking: pure commuter slow walkers, commuter slow walkers who use "slow traffic + public transport" and non-commuter slow walkers who

[41] Yang Li. Study on the development strategy of slow walking system in high-density urban development areas[J]. Traffic and Transportation,2021,34(S1):187-191.

[42] Xia Tian. Study on the systematization of slow-moving traffic in urban areas [D]. Beijing Jiaotong University, 2011.

use slow walking as a means of, for example, leisure and fitness. Slow walking behaviour is a dynamic element of the slow walking system[43]. It changes in line with social, economic and urban development, with a variety of functional categories (Table 2-1).

Table 2-1 Slow-moving activity functions (Resource:The aesthetics of the street)

Type of functions	Transport functions	Event functions	Health functions	Leisure functions	Commercial functions	Refuge function
Examples of activities	Short distance travel, interchange with public transport	Various types of public activities	The act of exercising on forest trails and mountain biking	Park and street green space fun activities	Shopping behaviour in shopping streets	Evacuation behaviour in times of disaster in the Plaza Park Green

2.4.2 Characteristics of urban slow traffic

Urban slow traffic has the following characteristics：

（1）The coverage is extensive, and the basic activities of residents in the urban public space are inseparable from slow traffic, which constitutes a wide range of activities such as travel, shopping and commuting[44].

（2）Comfortable and environmentally friendly, energy efficient and fit, short commute, etc.[45]. Beneficial to healthy living and green mobility, slow-moving traffic is human-powered and does not consume energy.

[43] Li Wenjing, Zhai Guofang, He Zhongyu, et al. The inspiration of Japan's station-city integrated development to China's high-speed railway new city construction--the example of New Yokohama Station[J]. International Urban Planning,2016(3):111-118.

[44] Nie Yueming. Analysis of slow travel behavior considering slow traffic connectivity improvement[D]. Beijing Jiaotong University, 2020. DOI:10.26944/d.cnki.gbfju.2020.001066.

[45] Chen Leihua. Analysis of urban road slow walking system arrangement scheme[J]. Fujian Construction Science and Technology,2022(05):117-119.

（3）In current traffic planning and traffic safety management, slow-moving traffic in many cities in China is greatly infringed upon in terms of right of way and priority and is in a vulnerable position, with the integrity and continuity of cycle paths and trails being undermined and the safety and convenience of slow-moving traffic users being threatened.

2.4.3 Pedestrian traffic characteristics

Pedestrian traffic is not only flexible, but also convenient, and at the same time has the following characteristics:

（1）In the age distribution structure of pedestrians, walking is the most important way for the elderly and children to travel, with more than 50% of each city's elderly travel patterns occurring in walking areas. The elderly are more concerned about the use of slow traffic spaces and generally pay more attention to the environment and changes in slow traffic spaces[46].

（2）The distribution of walking time has a peak. There are four peak walking periods in a day: 9-11 a.m. when people go to work and school, 1-3 p.m. when they leave work and school, 15-16 p.m. when they go to work in the afternoon, and 19-20 p.m. when they leave school in the evening, with slow walkers being significantly more likely to walk during the peak commuting period than during the middle period. Two small peaks[47].

The irregularity of the pedestrian space. The planning and design of pedestrian space must be linked to the design of roads. In the process of rapid urbanisation and motorisation, pedestrian space is squeezed and interrupted, resulting in an uneven spatial distribution and spatial quality of the overall pedestrian system environment.

[46] Wang Xin. Creating a humane urban walking environment--a trial of landscape design for urban walking space[J]. Writer, 2010(08):259-260.

[47] Cui Ying. Research on the planning method of pedestrian transportation system in large urban downtown area[D]. Southeast University, 2016.

（4）Pedestrian traffic is also diverse and complex in nature. Urban slow-moving systems need to accommodate the diversity of pedestrian behaviour, which is far more complex on the walking space than when exercised by motorists. Due to the flexibility of pedestrian walking, pedestrians can also 'change their mind' for various reasons when undertaking walking activities, which can lead to changes in walking behaviour.

2.4.4 Bicycle traffic characteristics

As a short and medium distance travel mode, bicycle transportation is convenient, flexible, green and economical, and has the function of leisure and fitness[48]. In urban life, it also has the following characteristics：

（1）There are advantages in travelling short and medium distances. Cycling speeds range from 10-20 km/h, faster than walking but lower than vehicle speeds. Bicycles have a definite advantage over walking, public transport, taxis and cars for trips of up to 7km[49].

（2）Concentrated distribution of bicycle traffic. Due to the functional zoning of the city, bicycle traffic tends to be in areas with better road conditions and concentrated pedestrian traffic. As a more economical mode of transport, bicycles are very popular with the average income group and are more concentrated in labour-intensive industrial areas, especially during commuting time areas, where bicycle traffic tends to be more concentrated and oriented.

（3）There is a higher demand for space for transport than for walking. Bicycles are driven by people and therefore place certain demands on roads and associated facilities. Bicycles are not suitable for climbing and are far less adaptable to ramps than motorised volumes and less adaptable than walking. In terms of traffic space, the conflict between road space required for

[48] Zhang Tao, Shanghai Urban Construction Design and Research Institute, Shanghai Urban Construction Design and Research Institute, Key points of bicycle planning and design for livable communities in Shanghai and its application[J]. Traffic and Transportation, 2016(A01):199-204.

[49] Bian Yang, Hao Meng. A study on the experience of bicycle development in typical foreign cities[J]. Traffic Engineering,2019,19(S1) : 1-4+20.

cycle traffic and motorised road space is greater than the conflict between cycle and pedestrian space[50].

2.5 The relationship between slow traffic and urban renewal

2.5.1 Urban renewal is a catalyst for slow traffic

Urban renewal is a catalyst for slow traffic because it is often accompanied by improvements and upgrades to urban infrastructure, which often include measures such as improvements to walking and cycling paths, new cycle paths, additional footbridges and underpasses, and improvements to public transport systems. These measures provide better infrastructure and environment for slow traffic and make people more willing to use low-carbon modes of transport. For example, improved walking and cycling paths can facilitate the development of slow traffic by making it easier for people to walk and cycle while reducing reliance on cars. New cycle paths, on the other hand, provide a safer and more convenient cycling environment, encouraging people to cycle instead of driving. Additional footbridges and underpasses can improve pedestrian safety and efficiency and reduce traffic conflicts between footpaths and carriageways. Improvements to the public transport system can improve the quality and efficiency of public transport services and encourage greater use of public transport, thereby reducing the number of cycling trips.

Urban renewal is mainly carried out in old urban areas, where comprehensive improvement, functional replacement, demolition and reconstruction are adopted for the already formed urban functions, infrastructure and residents' travel activity patterns. The urban renewal activity itself will change the nature of the land and the supply of transport facilities in the area, thus affecting the demand for transport and the structure of travel modes. The new land use pattern of the regeneration area will reshape the transport system in the area, and the change in the scale of urban construction will also have a significant impact on the urban transport system.

[50] Liu Jiajia. Research on the optimization method of urban bicycle transportation system[J]. Traffic Engineering,2022,22(04):40-45+64. DOI:10.13986/j.cnki.jote.2022.04.006.

The urban renewal project follows the concept of intensive optimisation and people-oriented development, optimising all aspects of the land layout and transport environment of the renewal area, breaking through traditional development bottlenecks and promoting the efficient operation of the internal clusters. The focus is on strengthening the infrastructure coordination between the regeneration area and the surrounding areas, inheriting and continuing the transport development mechanism of the area, appropriately expanding the vertical space, constructing a three-dimensional urban transport system and improving transport functions.

（1）Urban renewal is an opportunity to upgrade road traffic facilities in old urban areas

In the past, the focus of development has been excessively on new towns or new urban areas, with the rapid expansion of cities driving economic development and raising the level of urbanisation. The rapid population build-up in developed urban areas has greatly exceeded the carrying capacity of existing facilities, and this phenomenon has not been properly addressed for a long time, with only temporary measures being taken to alleviate the conflict. With the advent of the stock era and urban regeneration, there is a unique opportunity to systematically address the road traffic facilities in developed urban areas. In the context of urban regeneration objectives, the issues of funding, land, property rights and policies for the optimisation and upgrading of road traffic facilities are being addressed in a concerted manner, avoiding duplication of work and the difficulties of coordination between multiple parties individually.

（2）Excellent transport conditions are an important support for the revitalisation of the old urban areas

Integrating the habits of the original inhabitants of the developed urban areas with new businesses and spaces that meet the needs of the people for a better life is an important step in sustaining the development of the old urban areas, while the streets, as a key component of the public space that activates the vitality of the developed urban areas, need to play a

connecting and stitching role. The problems of crowded pedestrian rights of way, low accessibility to public transport and inadequate parking ratios for public facilities in developed urban areas are serious constraints to the reinvention of neighbourhood vitality and need to be addressed in the urban regeneration process.

2.5.2 Slow traffic is an essential part of urban renewal

Diversity is the hallmark of urban life. If a city is obsessed with building "fast" and neglects the need for "slow", and ignores diversity in transport, it will not only fail to make people enjoy the convenience of the city, but also cause anxiety. In some cities, motorways are being built wider and wider, and traffic facilities are being set up to give priority to vehicles, but people are not getting around as easily as they could. Traffic jams, exhaust pollution and other "big city problems" plague those older cities that have developed first. Sometimes, buildings that are close at hand can be reached by pedestrians in long detours due to highways, overpasses and other traffic facilities that restrict pedestrian access. Promoting slow traffic can effectively enhance the quality of cities and have a positive impact on the effectiveness of urban regeneration efforts.

1.Reducing air pollution

The increase in the number of motor vehicles is making PM2.5 pollution more serious, exacerbating urban air pollution and affecting people's health. Reducing people's reliance on motor vehicles, reducing fuel consumption, reducing PM2.5 and other air pollutants from motor vehicle emissions, and increasing the construction of slow traffic systems can increase the use of walking and cycling, effectively reducing greenhouse gas levels, improving the air environment and improving the quality of urban health.

2.Reducing chronic diseases in the public

Increased use of motorised transport not only reduces the amount and duration of exercise, but increases the likelihood of obesity and overweight. Morris first validated the relationship between physical activity and health and found that people who always participated in physical activity had a much lower incidence of heart disease than those who did little

physical activity [51]. It has also been shown that walking and cycling users have lower rates of hypertension, diabetes and cardiovascular disease [52]. Therefore, reducing motor vehicle use and increasing slow traffic trips can have a positive impact on human health, increasing people's activity levels and improving health.

3.Making cities smoother

The implementation of urban slow walking systems is not only an inevitable choice to solve the problem of the "last mile" of public travel, but also a concrete measure to implement the concept of green travel. In urban transport, cycling is not much faster than travelling by car over shorter distances, and in traffic congestion, it is even faster. Therefore, a slow-moving system is not a deliberate attempt to slow down the city and does not add to the traffic congestion, but rather better meets individual needs and rationalises the allocation of transport resources. Only when the transport system achieves an organic combination of "fast" and "slow" can people travel smoothly.

4.Meeting travel needs

Urban renewal takes the basic needs of people as the basis for development, and through urban renewal to meet the needs of citizens in the four functions of living, working, transportation and leisure[53], the transportation space and corresponding supporting facilities should serve around people. Based on the perfection and balanced layout of public service facilities, people's travel behaviour is carried out through slow-moving traffic, and smooth and convenient slow-moving roads are the basic condition to attract people to carry out activities.

[51] Morris J N,Heady J A,Raffle P A B, et al.Coronary Heart-Disease and Physical Activity of Work[J].The Lancet,1953,262(6795):1053-1057.

[52] Zhu Changqing,Hao Shengfeng,Che Libin et al. A call for pedestrian and bicycle transportation development from a health perspective[J]. East China Highway,2014(5):91-93.

[53] Liu Limin, Wang Yina, Liu Bowen. The construction of "new urban renewal concept": the experience and development of urban renewal concept at home and abroad[J]. Economic Forum, 2022(12):15-23.

5.Improving the quality of life for citizens

Enhancing the spatial vitality of slow-moving nodes can effectively encourage social interaction and cohesion, thus generating subsequent health benefits. Respecting the local human and ecological atmosphere, optimising the landscape of slow walking spaces with the help of environmental features, forming an aesthetically pleasing and comfortable slow walking environment and creating a characteristic atmosphere can enhance people's physical sensory comfort and pleasure and improve their well-being. A vibrant slow-moving space increases the opportunities for urban residents to stay and interact, allowing people to relax and satisfy themselves on a spiritual and psychological level, reducing their social isolation and increasing their sense of interactivity and belonging, forming a high-quality, highly active and attractive urban space and improving the quality of life of citizens.

Based on the above analysis, the effectiveness of slow traffic systems in reducing air pollution, reducing chronic diseases, making cities smoother, meeting mobility needs and improving psychological well-being is closely related to the effectiveness of urban renewal efforts (Figure 2-2). It can be seen that slow traffic systems contribute positively to urban regeneration. On the one hand, it provides a healthy, comfortable and safe urban transport environment, and on the other hand, a slow traffic plan with a high degree of accessibility, connectivity and accessibility can influence people to choose to travel slowly and reduce the use of motor vehicles. With the guidance of a slow traffic system, people can slow down their travel speed and increase their opportunities for interaction, not only in terms of physical convenience and comfort, but also in terms of a pleasantly scaled and elegant slow-moving space where people can feel close and safe, increasing their sense of community belonging and psychological pleasure.

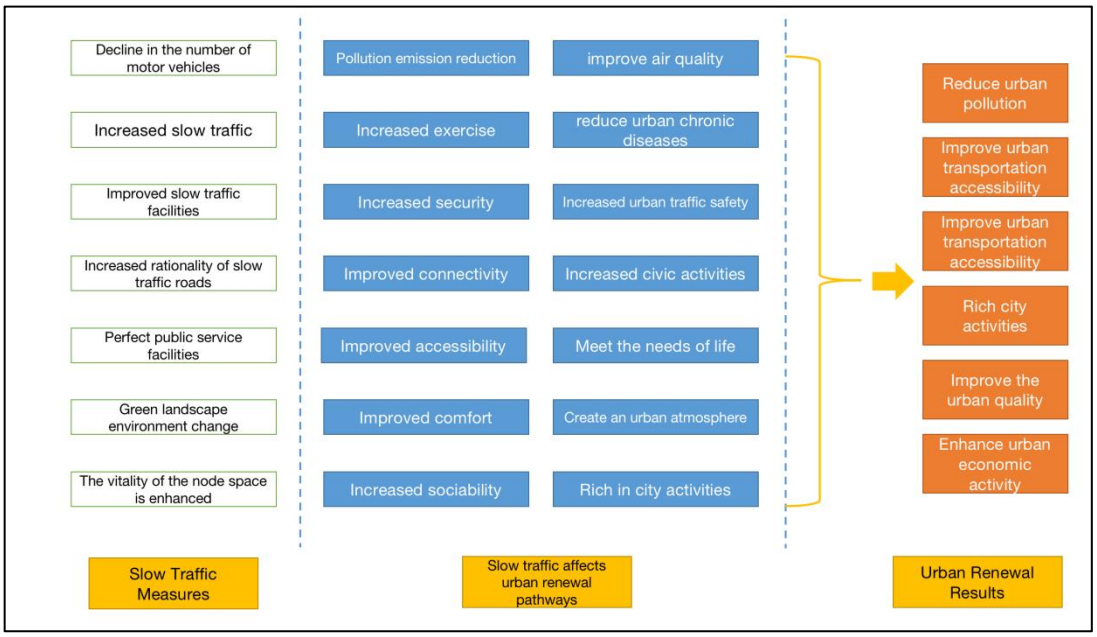

Figure 2-2 Urban Renewal and Slow Mobility Relationships Resources: Self-drawn by the author

slow traffic is not only a basic mode of transport for daily travel, but also an important material and spiritual carrier of urban life. By building an efficient, low-carbon, pleasant and comfortable slow traffic system, people can take initiative in high-quality urban slow traffic activities, increase walking or cycling traffic, strengthen physical exercise, promote healthy people, healthy environment and healthy society, etc., and achieve the ultimate goal of a healthy city. This is the goal of the urban regeneration process.

2.6 Chapter summary

This chapter begins with a review of the development of urban renewal theory, the research background of this thesis. Then summarises the relevant theories of slow traffic, summarises and concludes the classification, characteristics and elements of slow traffic. And the relationship between slow traffic and urban renewal is summarised and discussed to provide a theoretical basis for the research.

Chapter 3: Investigation of Racecourse plot

In the early 1990s, under the background of China's reform and development, Guangzhou's economy developed rapidly, and the urban spatial structure had undergone tremendous changes. A new commercial and business center was gradually formed with the Guangzhou Tianhe Sports Center as the core. At the same time, the Guangzhou Municipal Government put forward the urban development strategy of "going east" and "building an international city", requiring the development of the tertiary industry. Therefore, the construction of a brand-new urban center - Zhujiang New Town came into being.

Guangzhou Racecourse plot is located in the northeast of Zhujiang New Town, covering an area of more than 380,000 square meters. Guangzhou Racecourse opened in 1993. After the horse racing business was terminated in 1999, the Racecourse plot became Guangzhou Auto City. After 2014, the Auto City was completely closed, and now only the Food City in the southern section is still open.

3.1 Location and overview of the Racecourse plot

3.1.1 Location of the Racecourse plot

（1）Overview of Zhujiang New Town

Zhujiang New Town was initiated by the Guangzhou Municipal Government in 1993 and has now developed into an important commercial activity center in South China. Many landmark buildings in Guangzhou, such as Canton Tower, Guangzhou International Finance Center, Guangzhou CTF Finance Center, are located here. Zhujiang New Town is the main part of the CBD of Tianhe District, Guangzhou. Tianhe CBD is one of the three national central business districts approved by the State Council[54].Zhujiang New Town, which mainly serves the Zhujiang River Delta economic circle, is the largest CBD in southern China, a member of the

[54] Li Guohong, Shan Jingjing. China Business Center District Development Report. no.2 (2015). no.2 (2015), "Thirteenth Five-Year Plan": CBD leading regional synergistic development [M]. Social Science Literature Press, 2016.

World Business District Alliance, and a demonstration base for the liberalization of trade in services among Guangdong, Hong Kong and Macau, and has become a highly concentrated area for the economy and high-end industries such as finance, technology and business in southern China.

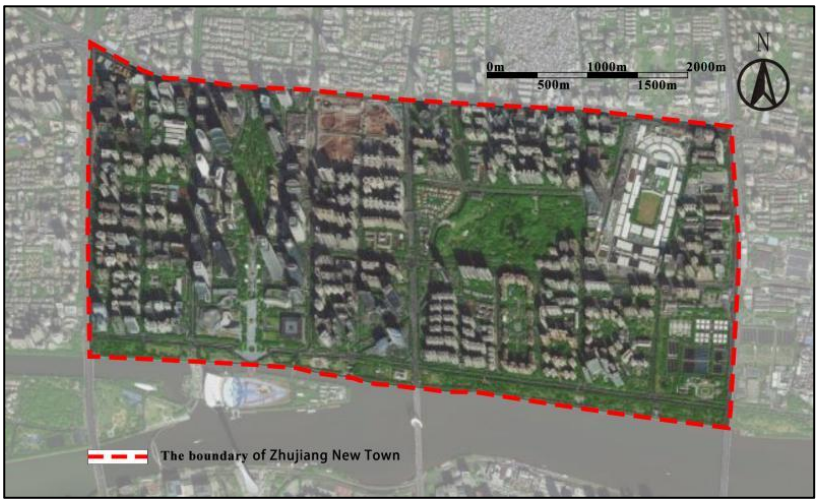

Figure 3-1 Range of zhujiang New Town Resource: Self-drawn by the author

Zhujiang New Town covers an area of 6.44 square kilometers, with Guangzhou's new urban axis running through it(Figure 3-1). With Xiancun Road as the boundary, it is divided into West District, Core District and East District: the West District is mainly business offices, Guangzhou New City Axis runs through the Core District to form a CBD complex, and the East District is mainly residential[55].

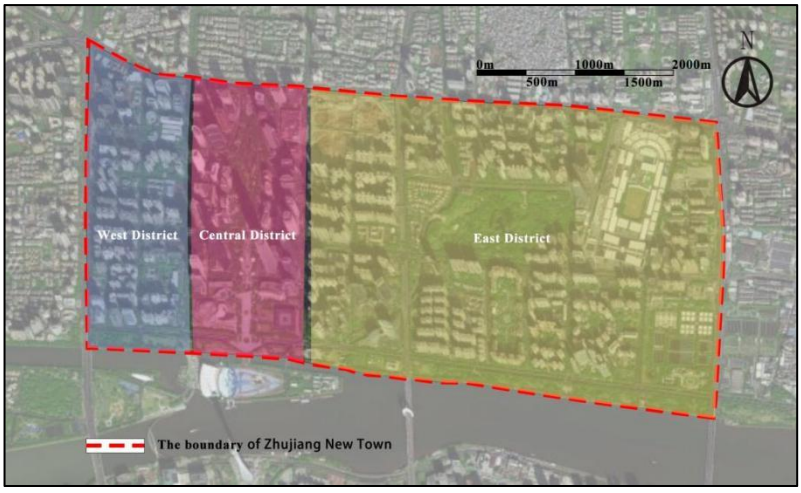

Figure 3-2 Zhujiang New Town Zoning Resource: Self-drawn by the author

[55] Ge Xiaoyin. Study on the evaluation of spatial green view rate of slow walking system in the core area of Zhujiang New City, Guangzhou[D]. South China University of Technology, 2020. DOI:10.27151/d.cnki.ghnlu.2020.001704.

（2） Zhujiang New Town Geographical Location

Zhujiang New Town, located in the western part of Tianhe District, Guangzhou City, China, is bounded by the South China Express Line in the east, Guangzhou Avenue in the west, theZhujiang in the south and Huangpu Avenue in the north, covering an area of 6.44 square kilometers, with the new urban axis of Guangzhou running through it. It aims to develop into an international level financial, trade, commercial, cultural and entertainment, foreign affairs and administrative district(Figure 3-3).

Figure 3-3 Location Map of Zhujiang New Town Image Source: Self-drawn by the author

3.1.2 Overview of Racecourse plot

(1) Geographical location

The Guangzhou Racecourse plot is located at No. 668 Huangpu Avenue West, Tianhe District, Guangzhou City, Guangdong Province, China. The site is oriented to the Shibai Campus of Jinan University to the north, adjacent toZhujiang Park to the west and Qiaoxin Huiyuetai, one of the top ten luxury residential properties in Guangzhou, to the south. That is, the northeast of Zhujiang New Town. Its north to Huangpu Avenue, west to Machang West Road, east to Tamcun Road and south to Machang North Road, covers an area of 380,000 square meters, which is equivalent to 53 international standard soccer fields, and is also more than 6.66 times the size of Guangzhou Zhengjia Plaza business circle(Figure 3-4).

Figure 3-4 Location map of the Racecourse plot Source: Self-drawn by the author

(2) Development History

Guangzhou Racecourse is a non-profit sports and entertainment organization under the leadership of the Guangzhou Municipal People's Government, and is the first prize racecourse with gaming in mainland China. At the time of its inauguration, the racecourse was the second largest in Asia after the Hong Kong Shatin Racecourse. Since its opening, the track has been running twice a week.

In the late 1980s, some people asked whether Guangzhou could try to run horse racing to raise welfare funds. In 1992, Guangzhou officially proposed a plan for holding horse racing events. Four shareholders, including Guangzhou Sports Development Co., Ltd., formed the "Guangzhou Jockey Club" with a registered capital of 66 million yuan. Subsequently, the Guangzhou Jockey Club invested more than 80 million yuan to build the racecourse.

On August 8, 1992, the construction of the Guangzhou Racecourse began. On January 28, 1993, a modern racecourse covering an area of 33 hectares with a capacity of 40,000 spectators was built on a vegetable field of about 340,000 square meters near Tan Village, Shipai. This is the only racecourse with gambling properties in mainland China, and the second largest racecourse in Asia after the Sha Tin Racecourse in Hong Kong.

1994 was the most popular time for Guangzhou horse racing. At that time, it started three times a week, held every Tuesday, Thursday and Sunday, with day races and night races. "At the beginning, there were 8 horse races on the opening day, and many people came to watch the horse racing as a form of entertainment." Chen Guangxin, a former member of the expert review team of China's speed horse racing rules, said in an interview with the media.

In 1998, Guangzhou Jockey Club had 5,000 members, 582 horse owners and more than 1,200 horses. The horses are mainly Yili horses and Sanhe horses. In 1999, the Guangzhou Jockey Club also imported more than 100 thoroughbred horses from Australia and transported them to the mainland by special plane, which caused a sensation. "Thoroughbred horses are all airlifted from Australia. A horse is worth more than 100,000 yuan, and more than 100 horses will be dispatched on a race day." Chen Guangxin said.

On December 14, 1999, after seven years and 757 horse races, the Guangzhou Racecourse suddenly announced its suspension of business.

In December 2002， after the horse racing business was terminated, Guangzhou adopted the suggestion of the Guangzhou Automobile Sales Association to transform the racecourse into an automobile city for public bidding. Since then, there have been disturbances until 2008. The Horse Racing Corporation took over the racecourse again and established the Auto City.

In May 2012, Tianhe District, Guangzhou City proposed that the Racecourse is leased for low-end industrial purposes such as car sales and catering, with extremely low economic benefits. The annual tax payment is only more than 20 million yuan, which is extremely incommensurate with the functional positioning of the CBD. Tianhe District will strive for the support of the municipal government to speed up the development and construction of the Happy Horse Field and enhance the value of the plot.

In 2013, the Horse Racing Corporation issued a "Notice on the Expiration of the Auto City Leasing Contract and Not Renewing the Contract". From April 1, 2019, the Auto City will be completely closed, and the water supply and power supply will be stopped.

In September 2014, a reporter from Times Weekly visited the racecourse and found that most of the car shops had been evacuated, with only a few shops making a high-profile announcement that they would not be evacuated, while the food court in the southern section was still open for business.

In September 2021, a document once again brought the Guangzhou Racecourse back to people's sight. The China Government Procurement Network posted a "Announcement on the Result of Winning the Bid (Transaction) of the Development Planning Project for the Improvement of the Functions of the Horse Field Plot in Tianhe District", and the Guangzhou Urban Planning, Survey and Design Institute won the bid. The announcement shows that the winning bidder needs to complete the four planning and design results of the racetrack site base research and judgment, functional positioning, case analysis, and space design within one year after signing the contrac[56].

From 1992 to the present, Guangzhou Racecourse has stumbled and groped for nearly 30 years. Today, in the context of urban renewal, it is necessary to improve the quality of its public space and paint a new future for it.

3.2 Investigation of the urban space of the Racecourse plot

3.2.1 Racecourse plot development process

This section divides the Racecourse plot into three phases based on the historical development of the Racecourse plot, namely: the racing use phase, the automobile city phase and the vacant phase.

[56] Announcement of the Results of the Tender (Completion) for the Project of Planning for the Functional Enhancement and Development of the Machang Site in Tianhe District

According to the different periods of the Racecourse plot combined with satellite pictures to grasp the evolution of the spatial form of the Racecourse plot in general, in the 1993-1999

Table 3-1 Different phases of the Racecourse plot (Resource :made by the author)

Time	Phase	Satellite image of the current situation
1993-1999	the racing use phase	
1999-2013	the automobile city phase	
2013-Now	the vacant phase	

horse racing use stage, the Racecourse plot was built according to the 1993 Zhujiang New Town Planning Guidance, and its spatial form was rectangular and had an obvious elliptical race track form.

After the horse racing activities were ordered to stop by the government in 1999, the Racecourse plot was transformed into an automobile city, with the business format mainly being automobile sales and display. Some buildings have been built on the plot to match the new business format. The oval shape of the race track is still retained, and the distribution of

buildings is basically distributed inside and outside the original track shape. The surrounding buildings have gradually started to be built compared with the buildings before 1999.

The Automobile City owner did not renew the lease after 2013 and the buildings on the site are mostly vacant. Only the Southern Food City is still operating well, while a golf course has been added to the original race track, but it is only open to members. The overall spatial form has not changed much, still retaining the oval-shaped race track form. The surrounding buildings are also almost completely built out.

3.2.2 Urban space of Racecourse plot

The existing buildings inside the Racecourse plot are mostly one-story car sales showrooms, with the Mahui furniture commercial buildings to the south. In its northern part some buildings have had a roof to add processing (Figure 3-6). Through on-site research, it can be found that the quality of the building condition within the Racecourse plot is mostly poor, and only the southern part of the Jockey Club home building quality condition is still relatively good (Figure 3-7).

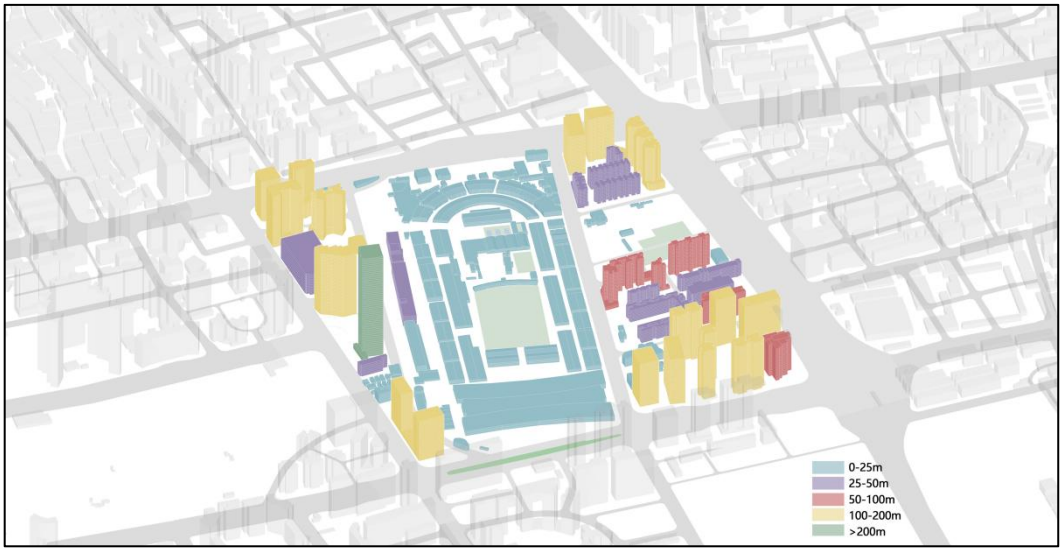

Figure 3-5 Status of the roof height of the buildings on the Racecourse plot

Source: Self-drawn by the author

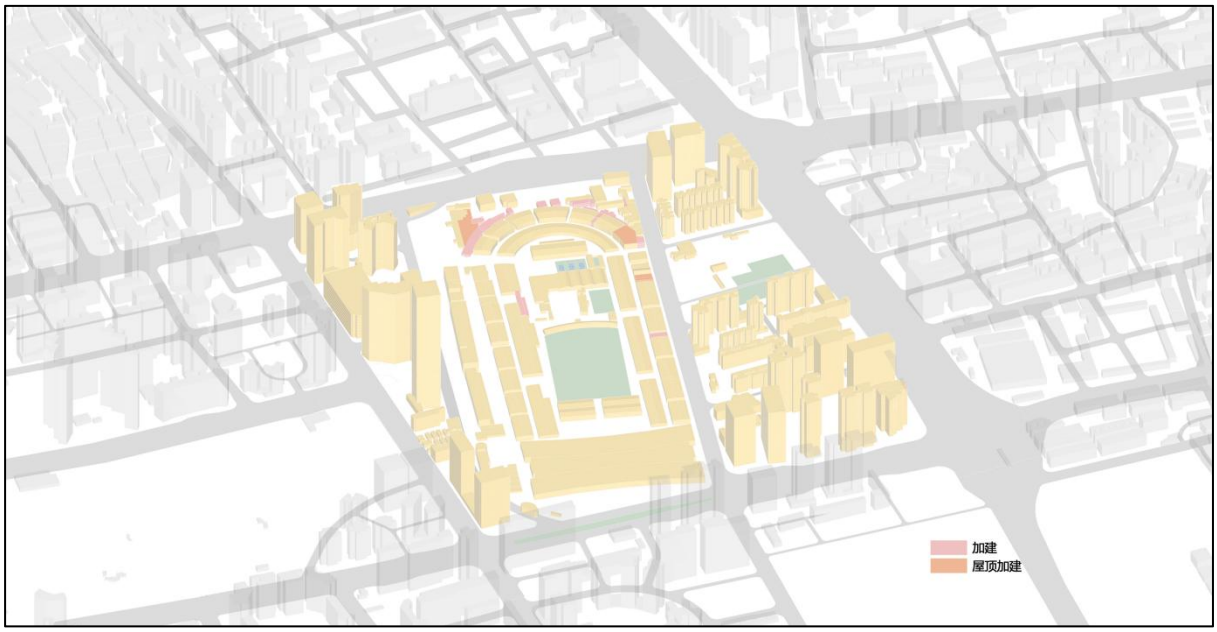

Figure 3-6 Current status of building roofs on the Racecourse plot Source: Self-drawn by the author

In terms of architectural form, the distribution of buildings inside the Racecourse plot always retains the elliptical form of the original race track.

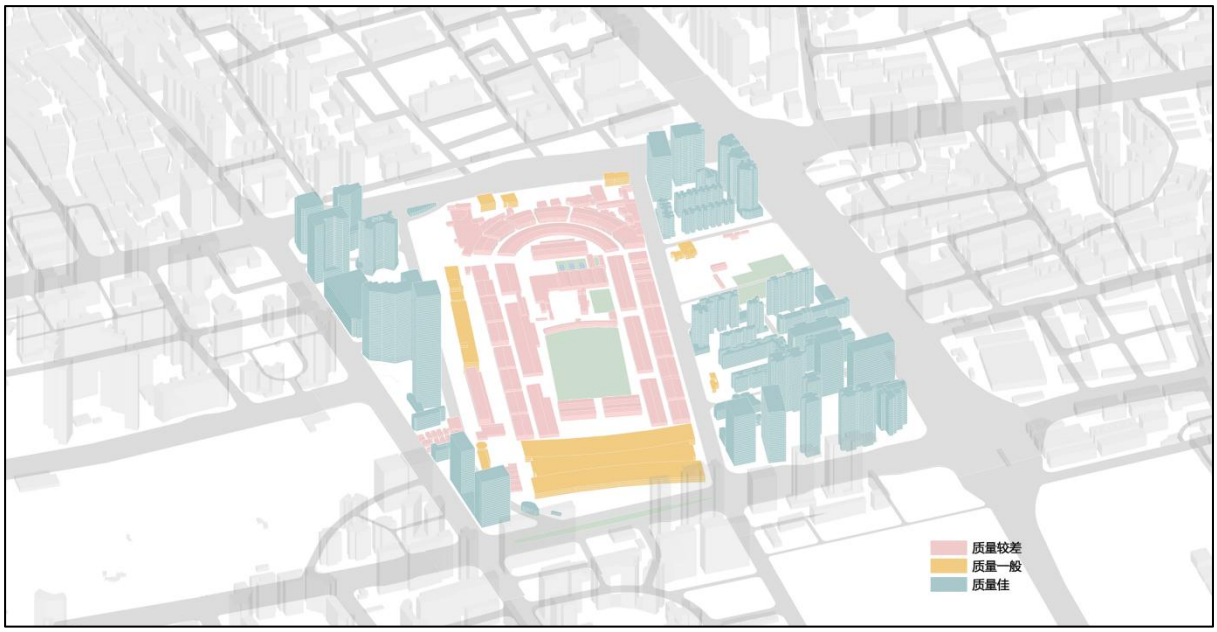

Figure 3-7 The current state of construction quality of the Racecourse plot Source: Self-drawn by the author

It is not difficult to see that the existing buildings in the Racecourse plot, whether in terms of function, height, floor area ratio and other aspects are extremely incompatible with the future planning and spatial quality improvement of Zhujiang New Town's positioning.

3.3 Current status of slow traffic in and around the Racecourse plot

3.3.1 Traffic around the Racecourse plot

Guangzhou Zhujiang New Town is located at the intersection of Tianhe, Yuexiu and Haizhu districts, from the South China Express Line in the east to Guangzhou Avenue in the west, from the Zhujiang River in the south to Huangpu Avenue in the north, and to the south of the most prosperous Tianhe North business district, inheriting the strong business atmosphere of Tianhe North and forming a new city central axis, connecting the traditional business area of Yuexiu District in the west and the eastern area to be developed, and passing through the southern group across the river. The location is unique. The total planned land area is 6.44 square kilometers, the core area is about 1 square kilometer, and the commercial building area is about 4.5 million square meters (Figure 3-8).

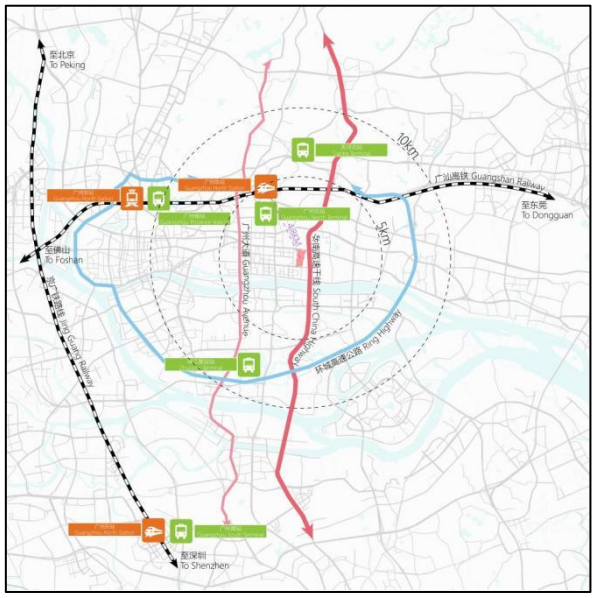

Figure 3-8 Current traffic situation aroundZhujiang New Town Resources: Self-drawn by the author

On the north side of Zhujiang New Town, there are Chaoshan High-speed Railway Line and Guangzhou East Station transportation junction, while Guangzhou Avenue and South China Expressway run north and south through Zhujiang New Town, of which South China Expressway is just east of the Racecourse plot. The nearby railway stations are: Guangzhou North Station and Guangzhou Station. With bus stations: Guangzhou North Station, Guangzhou Provincial Station, Tianhe North Station and Zhujiang Bus Station, it is easier to reach other urban areas in Guangzhou and regions outside the province (Figure 3-9).

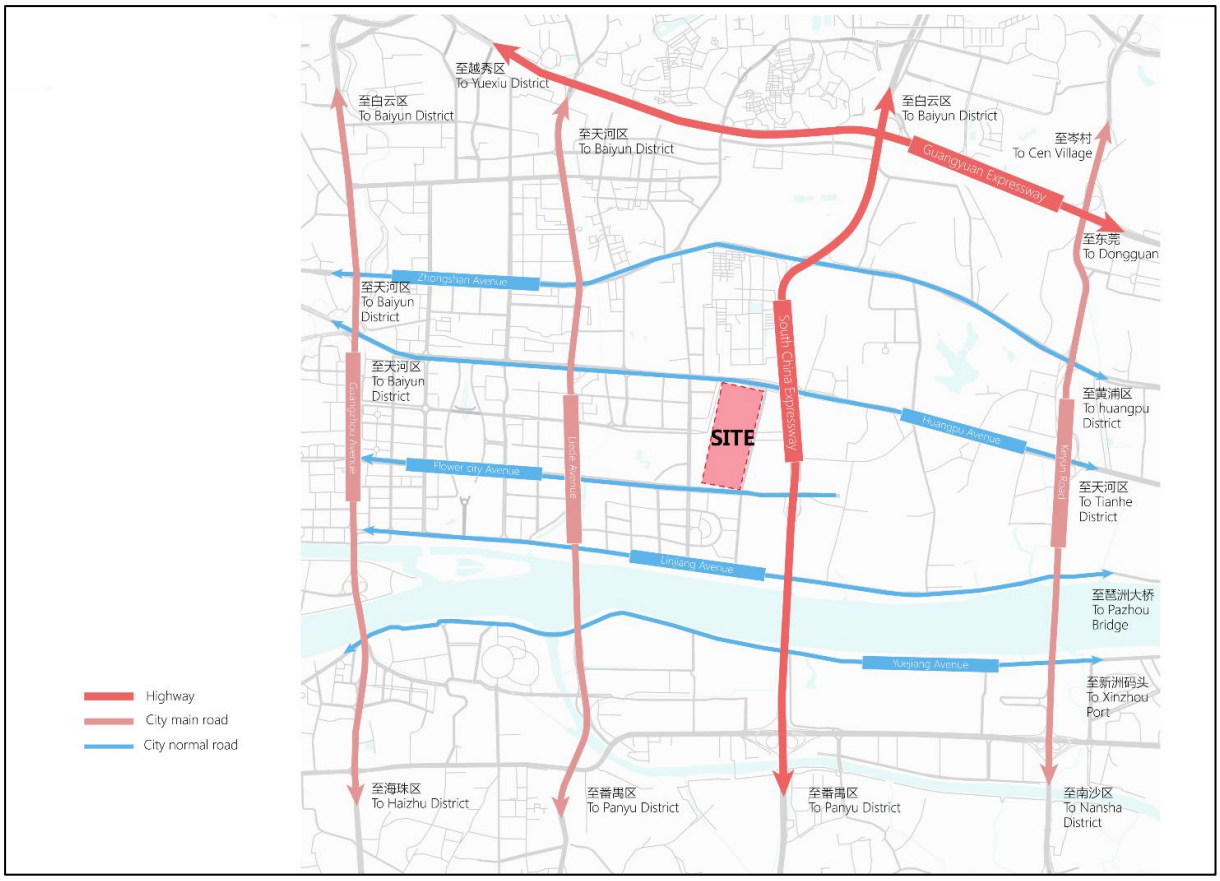

Figure 3-9 The current situation of road traffic around Zhujiang New Town　Resources: Self-drawn by the author

3.3.2 Public transportation on the Racecourse plot

Around the Racecourse plot, the north side is Huangpu Avenue which can reach various other areas in Tianhe District more easily. To the south is Huacheng Avenue, which is an internal road of Zhujiang New Town and cannot reach further areas of the city. To the east is the South China Expressway, which can reach Baiyun District to the north and Haizhu and Panyu Districts to the south. The site is surrounded by more urban bypasses, which also provide quicker access to the city's Zhujiang landscape shoreline（Figure3-10）.

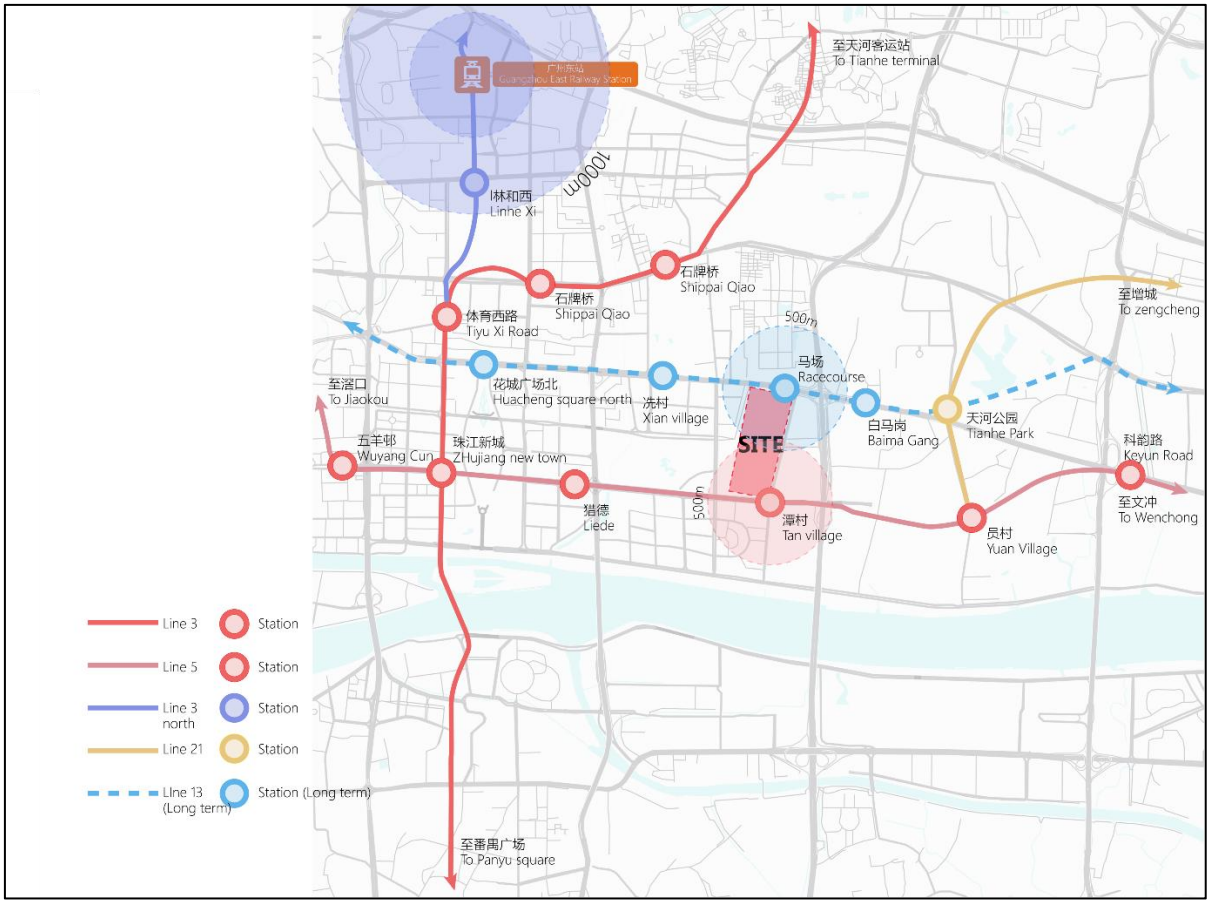

Figure 3-10 Current status of rail transportation around Zhujiang New Town Resources: Self-drawn by the author

There are four completed metro lines and one planned metro line in the vicinity of the Racecourse plot. Among them, Metro Line 5 passes through the southern boundary of the Racecourse plot and can reach Mahui Furniture City in the southern part of the Racecourse plot through Tancun Station, with two subway exits. And on the north side of the Racecourse plot is the Metro Line 13 under planning construction, which can reach the northern boundary of the Racecourse plot through the Racecourse station (Figure 3-11). It also provides access to the core area of Zhujiang New Town through these two metro stations and interchanges with Line 3 at the northern part of the line, from which it quickly reaches Guangzhou North Railway Station and Guangzhou Tianhe Bus Terminal, as well as southward to Haizhu and Panyu districts. The site is covered by rail transportation and is linked to various railway stations and bus terminals in Guangzhou.

There are many bus stops around the Racecourse plot, both on city arterial roads and city feeder roads, and bus lines are abundant. In general, the public travel traffic conditions around

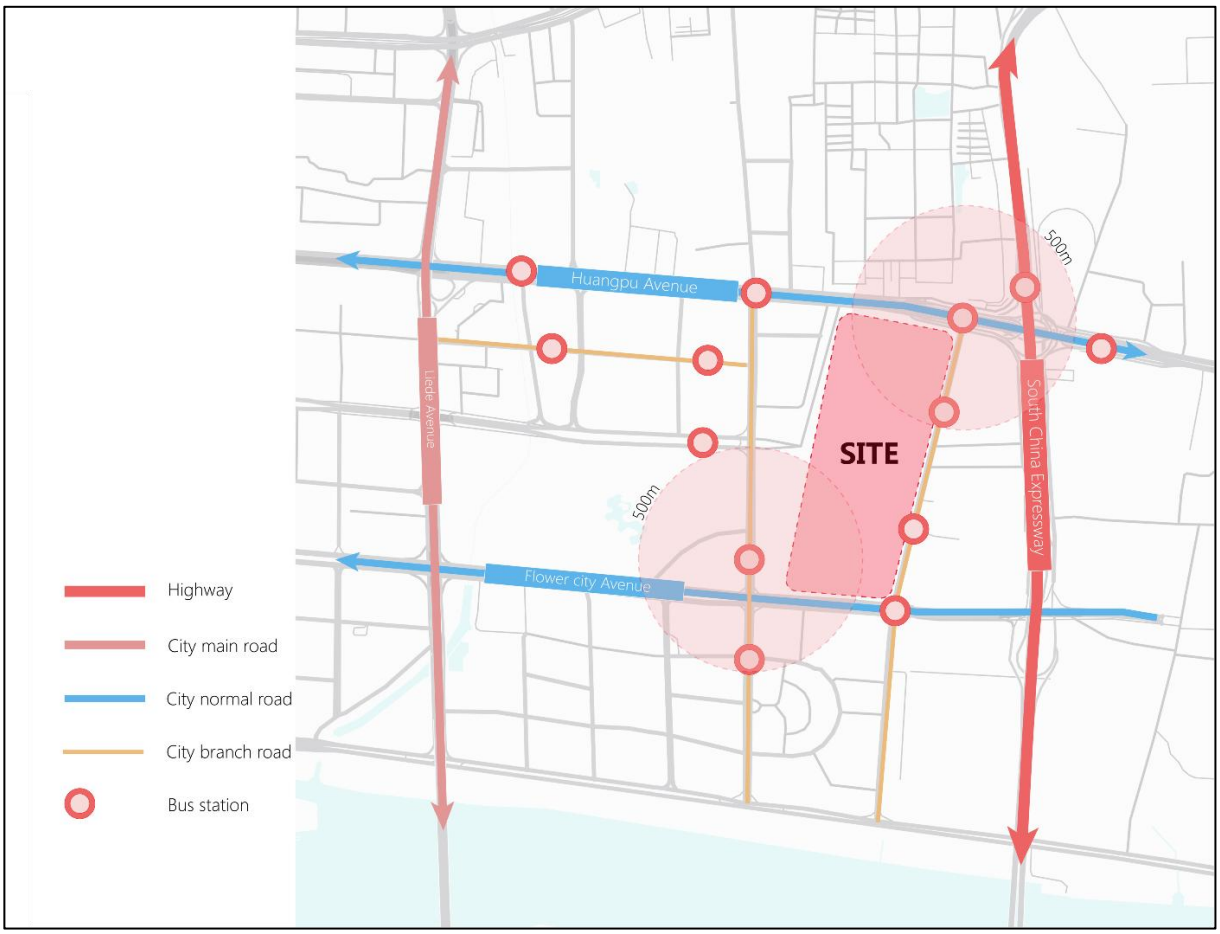

Figure 3-11 Current public transportation around the Racecourse plot Resources: Self-drawn by the author

the site are relatively convenient (Figure 3-11).

3.3.3 Status of pedestrian and cycle traffic on the Racecourse plot

（1）Racecourse plot walking traffic

Pedestrian paths: According to the current investigation, the pedestrian paths along the city roads outside the site are relatively complete, but there is basically no pedestrian path design inside the site. In terms of pedestrian relationship, there is basically no communication between the interior and exterior of the site, and there is no more direct and convenient pedestrian path for

Figure 3-12 Current status of the walking path around the Racecourse plot

Resources: Self-drawn by the author

the citizens around the site to reach the interior of the site. The pedestrian paths on both sides of the city road outside the site are not designed for pedestrian-friendly walking, but only for the engineering-oriented design of the regular street pedestrian paths(Figure 3-12).

（2）Internal traffic of the Racecourse plot

The traffic route within the site follows to a certain extent the form of the original race track, but the overall arrangement is rather random, without a strict systematic planning. There are entrance links with the main urban arteries around the site, but there are more cut-off roads within the site. The roads through the site are mainly the East Road of the Racecourse in the north, which coordinates the east-west crossing, and the Middle Road in the west, which is responsible for the north-south crossing. The internal traffic routes are confusing and not clearly guided(Figure 3-13).

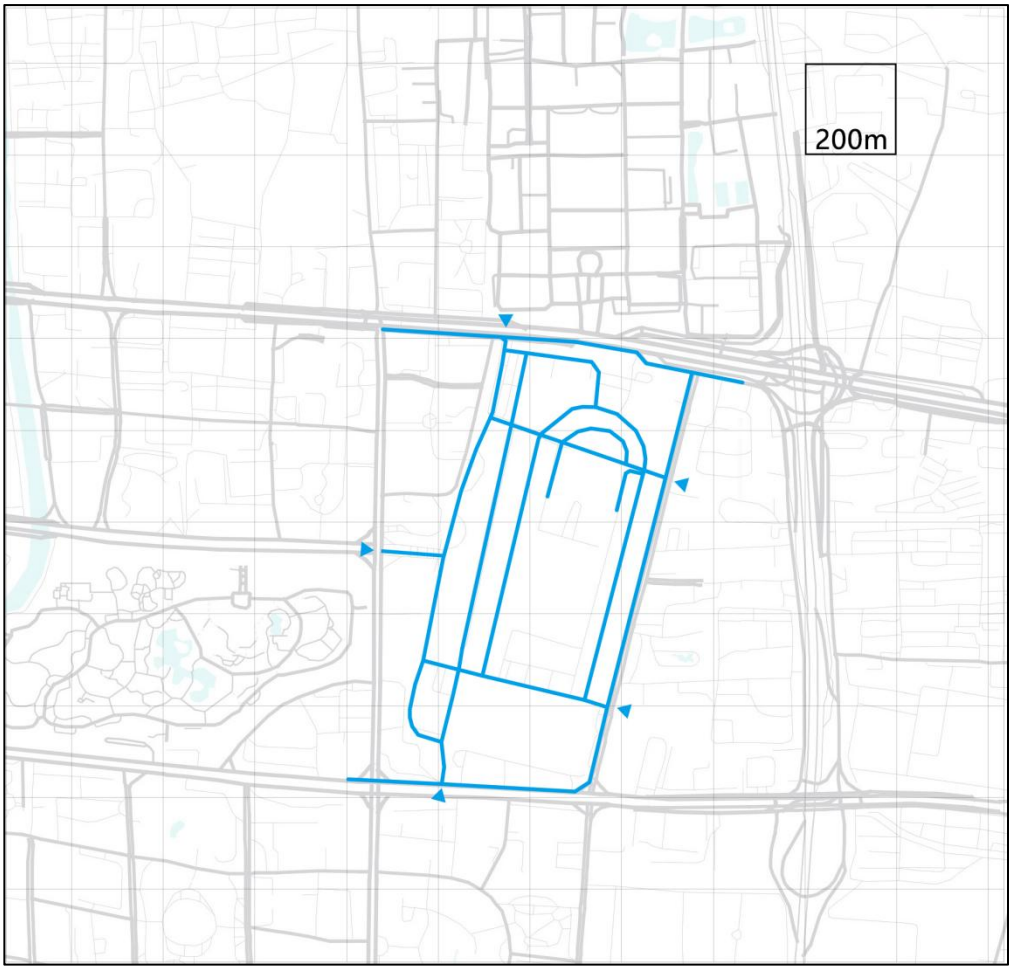

Figure 3-13 Current internal traffic of the Racecourse plot　Resources: Self-drawn by the author

There are a large number of parking spaces inside the site, and the parking lots are relatively random and disorganized in terms of distribution, which are basically set up as parking spaces at the locations near the entrances and exits of various traffic roads in combination with vacant spaces, which has a poor impact on walking and spatial experience (Figure 3-14).

Figure 3-14 Current internal space of the Racecourse plot Resources: Self-drawn by the author

3.3 Research on the slow traffic environment of the Racecourse plot

3.3.1 Research areas selection

Since the interior of the Racecourse plot is a paid golf club, most of the space is not open to the general public, and there is no corresponding slow traffic design (Figure 3-15 3-16 3-17), so this research mainly selects several core roads and their spaces inside and around the Racecourse plot as the research selection points.

Figure 3-15 3-16 3-17 Golf club inside the Racecourse plot, space inside the Racecourse plot, useless road inside the Racecourse Resources: Self-drawn by the author

Combining the traffic inside and outside the racecourse as well as the urban space, the following six areas were selected for the research of slow traffic and slow moving environment. They are : 01 Tam Tsuen Road area, 02 Flower City Avenue area, 03 Machang West Road area, 04 Machang Middle Road area, 05 Sangying West Road area and 06 Machang Road area, according to the field research to draw the following road cross-sectional drawings, the Racecourse plot inside and outside the slow moving environment for research (Figure 3-18).

Figure 3-18 Research areas selection Resources: Self-drawn by the author

3.3.2 Road cross-section analysis

(1) Tam Tsuen Road area

The Tam Tsuen road section is located on the east side of the Racecourse plot. The road width of the Tam Tsuen road section is 24 metres and the carriageway is a two-way four-lane road , 15 metres wide, with pavements on both sides. The pavement and the motor road are separated by a green belt. The pavement is 4 metres wide on one side and 13 metres wide on the other, but is divided by a height difference into two parts of 5 metres and 8 metres, with the 8 metre wide section adjacent to the buildings along the street. On both sides of the pavement there are bicycle lanes, but there is no difference in the paving material(Figure3-19).

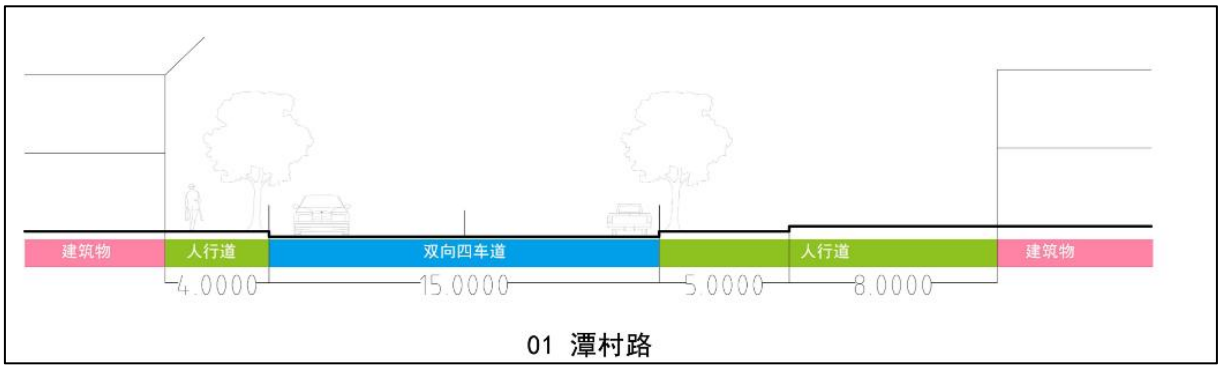

Figure 3-19 Tam Tsuen Road road section Resources: Self-drawn by the author

（2）Flower City Avenue area

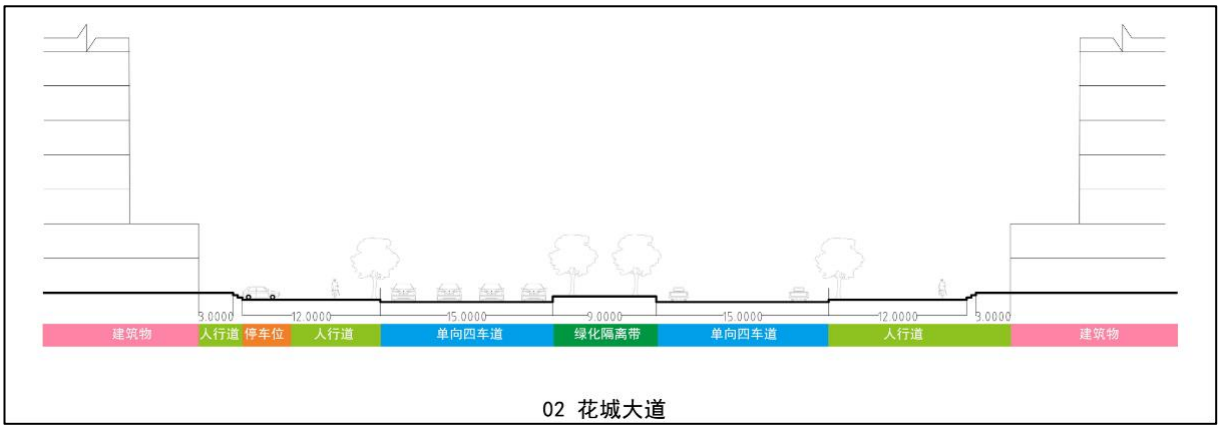

Figure 3-20 Huacheng Avenue road section Resource: Self-drawn by the author

Located on the southern side of the Racecourse plot, Huacheng Avenue is one of the main arterial roads of Zhujiang New Town. As an arterial road in Zhujiang New Town, the Flower City Avenue has a total road width of 63 metres, with the traveled road consisting of two

one-way four-lane roads of 15 metres wide, separated by a 9-metre wide green belt. On both the left and right side of the road there are 12m wide footpaths, with specially paved and coloured cycle lanes in the middle of the walkway. Parking spaces are also provided between the pavement and the buildings on one side of the road, to a certain extent separating pedestrians on foot from the street(Figure 3-20).

（3）Machang West Road area

Machang West Road is located on the west side of the Racecourse plot and is an internal road within the Racecourse plot. The total width of the road is 17.5 metres, with two lanes of traffic in both directions and 5-metre wide parking spaces on both sides of the road. There is no dedicated pedestrian access or cycle lane and the road is mixed with pedestrian and vehicular traffic on a daily basis(Figure 3-21).

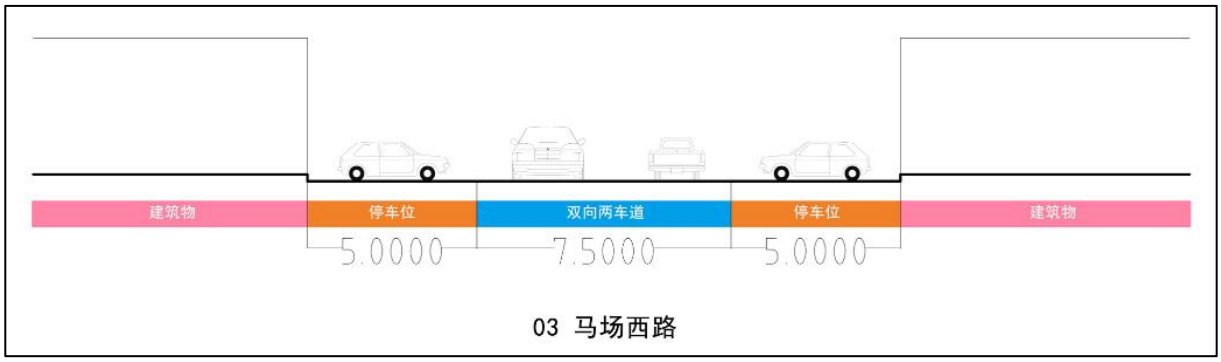

Figure 3-21 Machang West Road road section Resource: Self-drawn by the author

（4）Machang Middle Road area

Machang Middle Road is located in the central west of the interior of the Racecourse plot. The road has a total width of 17.5 metres and consists of two one-way single carriageways, both 3.75 metres wide, with 5 metre wide parking spaces occupying the road space on one side of the road and between the two motorways. There are no footpaths or

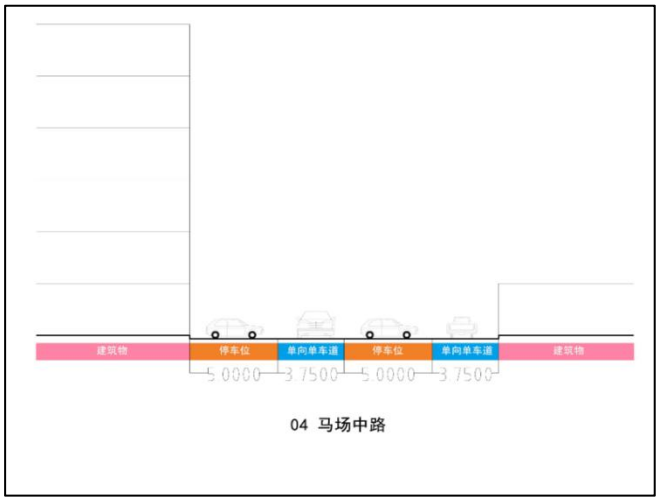

Figure 3-22 Machang Mid Road road section Resource: Self-drawn by the author

cycle lanes and a large amount of space is taken up by parking spaces(Figure 3-22).

（5）San Ying West Road area

San Ying West Road is located in the central location within the Racecourse plot and has a total road width of 10 metres. The motorway is a wide beltway is 7.5m two-way dual carriageway with a 2.5m wide parking space on one side of the road. There are no pedestrian footpaths or cycle lanes. The road space is occupied by extensive parking(Figure 3-23).

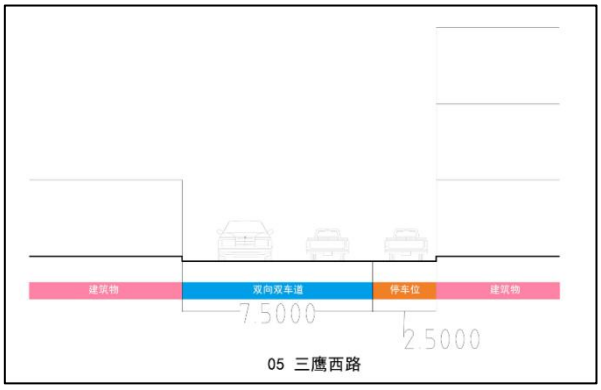

Figure 3-23 Sanying West Road road section Resource: Self-drawn by the author

（6）Machang Road area

Machang Road is located to the north of the Racecourse plot and is the main external traffic road to the north of the Racecourse plot. The total width of the road is 41.9 metres. The motorway consists of two one-way three-lane roads with a width of 11.25m and a 3m wide green belt in the middle. The width of the pavement on one side of the road is 4 metres and the width of the pavement on the other side is 10 metres. On both sides of the pavement and the motorway there are cycle lanes of 1.2m width. This is also an urban road with some slow

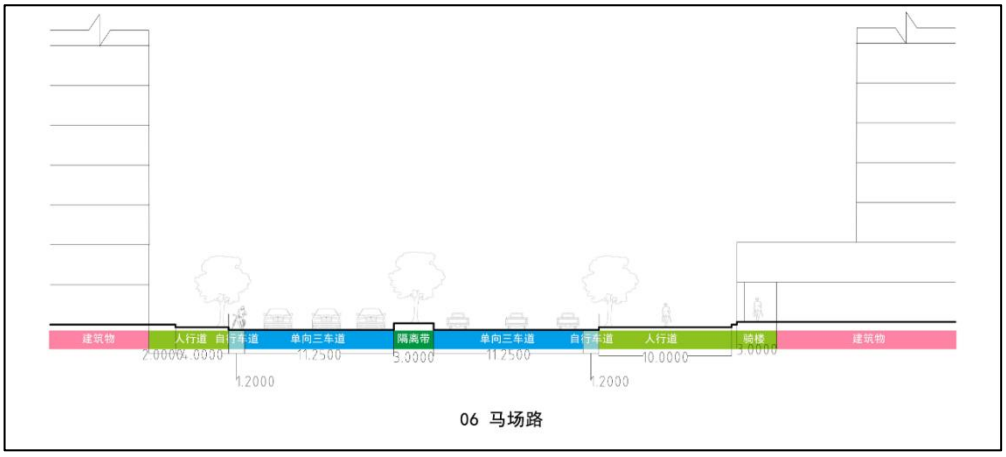

Figure 3-24 Machang Road road section Resource: Self-drawn by the author

traffic design around the Racecourse plot(Figure 3-24).

3.3.3 Slow traffic environment research

(1) Tam Tsuen Road area

① Walking and cycling environment

Figure 3-25 slow traffic environment in Tam Tsuen Road area 1

Resource: Photo by the author

Tam Tsuen Road has an integrated design of pedestrian and cycle paths, with the cycle paths distinguished from the footpaths by different colours(Figure3-25). However there is no difference in the paving between the two. The pedestrian and cycle paths are separated from the motorway by road guardrails. However, according to the research, individual sections are not equipped with guardrails and there are localised phenomena of motor vehicles driving onto the pavement(Figure 3-26).

② Interchange system

Instead of using an 'island' bus stop, the Tam Tsuen section of the feeder system is directly integrated with the pavement green belt. At the same time, shared bicycle parking is also provided in conjunction with the pavement green belt. This is an 'integrated bus and bicycle design'.

Figure 3-26 slow traffic environment in Tam Tsuen Road area 2

Resource: Photo by the author

（2）Flower City Avenue area

① Walking and cycling environment

The design of the pedestrian and cycling environment on Flower City Avenue is one of the more in-depth road designs around the Racecourse plot. As a major arterial road in Zhujiang New Town, it is designed with wide pavements, while the bicycle lane is separated from the motorway by green flower beds, which is friendly to pedestrians and does not fragment the relationship between the road and pedestrians. However, during the study, it was found that some sections of the road are confusing for bicycle parking, which affects the pedestrian experience to a certain extent(Figure3-27).

Figure 3-27 slow traffic environment in Huacheng Avenue area

Resource: Photo by the author

② Interchange system

Figure 3-28 slow traffic environment in Huacheng Avenue area

Resource: Photo by the author

Due to the high road grade and the large width of the pavement on Flower City Avenue, the bus feeder system platform is designed with a bus-only parking space solution, which is safer for slow-moving people. However, the arrangement of the self-bicycle parking spaces is not arranged in conjunction with the location of the bus stops, which is less conducive to the design of an efficient slow-moving integrated system(Figure 3-28).

（3）Machang West Road area

① Slow walking and cycling environment

Machang West Road, as the western boundary road of the Racecourse plot, has a pavement only on the side adjacent to the internal side of the Racecourse plot. The pavement has a separate paving set up, but the width of the pavement is affected by the old buildings and the width of the pavement varies considerably. There is no cycle path design and no cycle parking arrangement. The slow traffic environment is not very pedestrian friendly(Figure 3-29).

Figure 3-29 slow traffic environment in Machang West Road area

Resource: Photo by the author

② Interchange system

As the Racecourse plot is currently used as an unused site in Zhujiang New Town, the bus route plan does not pass through this road, there is no bus stop arrangement and no bicycle parking design. There is no feeder system in place. What's more, it is not possible to form a slow-moving link between the Racecourse plot and the surrounding area.

（4）Machang Middle Road area

① Slow walking and cycling environment

There is no dedicated pavement design, let alone a cycle lane design or cycle parking arrangement on Machang Middle Road. The road is basically a mixed pattern of motorised and non-motorised vehicles and pedestrians. Both sides of the road are occupied by a large number of motor vehicle parking spaces(Figure 3-30). There is basically no slow traffic environment to speak of. This is also related to the current facility and historical development of the Racecourse plot. This is also an issue that needs to be addressed in the subsequent

urban design.

Figure 3-30 slow traffic environment in Machang Mid Road area

Resource: Photo by the author

② Interchange system

For the same reason as Racecourse Road West, as an internal road within the Racecourse plot, there is no feeder interchange system.

（5）San Ying West Road area

① Slow walking and cycling environment

San Ying West Road is located within the Racecourse and the road environment is heavily influenced by the previous businesses. The main business of the Racecourse plot was previously a car town, and the main buildings on both sides of the road are car sales showrooms. The road has no dedicated footpaths or bicycle lanes and is designed for mixed traffic of motor vehicles and pedestrians. And the same road

Figure 3-31 slow traffic environment in Sanying West Road area

Resource: Photo by the author

space is occupied by a large number of parking spaces (Figure 3-31).

② Interchange system

As an internal road within the Racecourse, the basic common problem is that urban public transport is not introduced into the site, and none of the roads are supported by a feeder interchange system.

（6）Machang Road area

① Slow walking and cycling environment

Machang Road, an urban arterial road on the northern side of the Racecourse plot, has a dedicated pedestrian path design. The pedestrian path is separated from the motorway by a guardrail, providing a high level of pedestrian safety. The pedestrian system is well designed with an underground entrance to the pedestrian walkway. There are also bicycle parking spaces, but no dedicated cycle paths(Figure 3-32).

Figure 3-32 slow traffic environment in Machang Road area

Resource: Photo by the author

② Interchange system

The bus stop on Machang Road is neither designed as an island stop nor as a dedicated parking space for buses, and is directly connected to the bus by removing the guardrail at the bus stop's pedestrian stop. There are bicycle parking spaces around the bus stop and the bus stop is located close to the city's underground pedestrian system, which has the characteristics of an integrated slow-moving feeder system, but there is still room for design

improvements(Figure 3-33).

Figure 3-33slow traffic environment in Machang Road area Resource: Photo by the author

3.3.7 Summary

Through the research on the roads and road moving environment of the Racecourse plot, it is easy to see that the slow traffic system in and around the Racecourse plot needs to be improved. With the exception of the early Flower City Avenue, which has a relatively well-designed slow traffic system, the rest of the roads have more or less inadequate slow traffic system design problems. This problem is even more serious on the internal roads of the Racecourse plot, where almost all roads do not have any slow traffic design and almost all use mixed pedestrian and vehicular traffic (Table 3-2). Moreover, the road space is heavily occupied by parking spaces, and cars seriously infringe on the living space of the public. The inadequate design of slow traffic within the Racecourse plot makes it impossible to form effective connections between the internal and external urban slow traffic systems of the Racecourse plot, and the slow traffic crowd cannot be effectively introduced into the Racecourse plot, which is perhaps one of the reasons for the poor development of the Racecourse plot's business. As the most straightforward way for people to get around, slow traffic is an important means of attracting people, developing businesses and enlivening the city's economy. The lack of effective slow traffic design can have a serious negative impact on the urban quality and economy of an urban area. As an urban design, it is important to

consider the concept of slow traffic.

Table 3-2 Research on the slow traffic environment of the Racecourse plot roads
（Resource: Investigation）

Roads	Pavement	Bicycle paths	Dedicated bicycle lanes	Integrated design of the interchange system
01Tam Tsuen Road	Yes	Yes	Yes（No paving changes）	Yes
02Flower City Avenue	Yes	Yes	Yes	Yes
03Machang West Road	Yes（one side）	No	No	No
04Machang Middle Road	No	No	No	No
05San Ying West Road	No	No	No	No
06Machang Road	Yes	Yes	No	Yes

3.5 Survey on slow movers on the Racecourse plot

3.5.1 Slow movers survey scheme

（1）Traffic Survey Programme

① Purpose of the survey: To grasp the spatial and temporal distribution of slow (walking and cycling) traffic flow on major road cross-sections and the slow environment of major roads through the survey, to understand the wishes and needs of the citizens and slow-moving people in and around the Racecourse plot for slow traffic on the one hand, and to provide guidance for the subsequent urban design of the Racecourse plot.

② Survey method: The survey was completed by manual observation, recording, and site survey methods. The survey points are combined with the implementation of on-site observation and survey of verification lines, roadway flow survey points and intersection flow survey points, and the survey is completed by means of on-site observation and counting.

③ Survey organisation and implementation: The survey was organised and implemented in the same way as the roadway traffic flow survey and the intersection flow survey. The survey was completed by means of street interviews and questionnaires distributed to the slow-moving population.

④ Survey process: The survey mainly went through the main work processes of survey programme preparation, selection of survey sites, questionnaire production, distribution of questionnaire forms, quality sampling and form collection. The survey covers the supply of transport infrastructure in terms of regional traffic, roads, public transport and parking, as well as the operation of transport facilities. In addition, flow surveys are conducted at important intersections.

⑤ Survey times: Peak traffic surveys are used, usually between 8-11am and 5-7pm.

⑥ Survey programme implementation process

Questionnaires were distributed to people walking on the streets and to residents in the neighbourhood. The survey was launched on 4 October 2022 and all questionnaires were collected on 25 October 2022, with 150 people surveyed and 116 forms collected. The survey mainly went through the main work processes such as survey programme preparation, questionnaire distribution, quality sampling and form collection. The quality of the

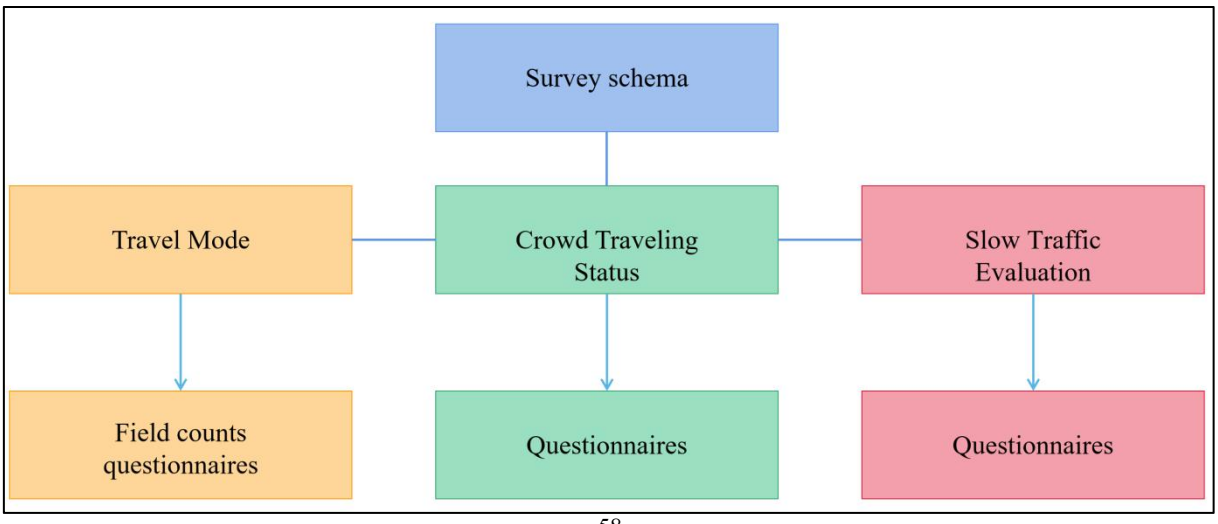

Figure 3-34 Research Structure Resource: Photo by the author

questionnaires collected showed that all the survey data were true and valid, except for some incomplete information. The data processing results show that the data objectively, truly and credibly reflect the travel characteristics and wishes of the residents around the Guangzhou Racecourse plot.

3.5.2 Content and results of the slow traffic population research

（1）Travel time, travel distance

The average travel time of residents around the Guangzhou Racecourse plot is 26.8 min, while the average travel time of slow travel is 22.5 min. the travel time on foot is shorter, about 21.7 min. according to the results of the residents' travel survey, it can be seen that the residents around the Racecourse plot have the highest proportion of slow travel, 37.9%, when they do not distinguish the travel distance. This is slightly higher than the proportion of private transport trips.

Table 3-3 Proportion of people travelling on the Racecourse plot by type of travel
（Resource：Questionnaire）

Type of travel	Slow traffic			Private transport		Public Transport		
	Walking	Bicycles	Electric bicycles	Cars	Motorbike	Buses	Taxis	Metro
Proportion	25.6	10.2	2.1	35.8	0	10.6	4.2	12.5
		37.9		35.8		27.3		

For trips less than 3km away, slow-moving traffic accounted for 41.72%, the highest proportion. The second highest proportion of trips is made by public transport at 38.65%. The lowest proportion of trips is made by private car(Figure 3-35).

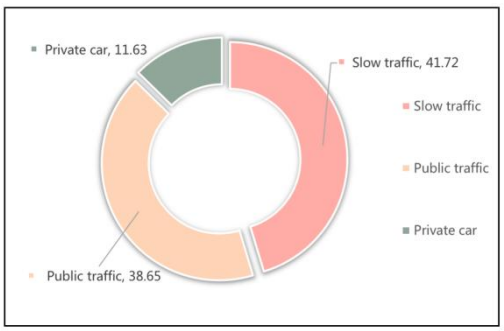

Figure 3-35 Proportion of travel modes within 3km
Resources: Questionnaires

When the distance travelled is greater than 3km, the private car takes the highest share with more than half, 51.02%. Public transport remains in second place at 42.16%. Due to the long travel distances, slow-moving modes of transport take up the smallest proportion of trips(Figure 3-36).

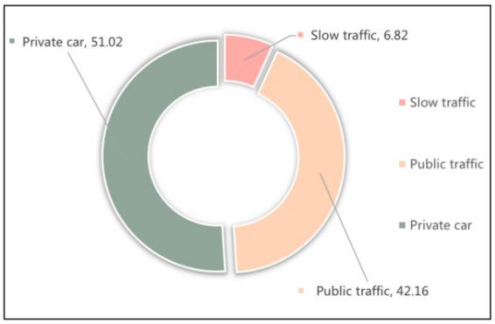

Figure 3-36 Proportion of travel modes over 3km

Resources: Questionnaires

(2) Survey on willingness to travel by slow traffic

The travel survey of the residents around the Racecourse plot was accompanied by a survey of people's willingness to travel. The travel intentions survey covered the residents' evaluation of the current traffic around the Racecourse plot, their views on cycling and their ideas for future transport development.

Questionnaires and public opinion surveys were conducted through a calendar of people at major nodes with high pedestrian flow on Huacheng Avenue, Machang Road, Tamcun Road and Machang West Road, as well as in the surrounding areas. The total number of surveys was 150, and 116 valid questionnaires were returned (the minimum value of the questionnaire sample was ≥100, using statistical significance).

① What people say about cycling (travel)

According to the survey, more than 60% of residents believe that bicycles are a convenient means of transport and should be given more convenience in terms of traffic management, while only 8.27% of residents believe that bicycle traffic is not good for much and should be restricted. It can be seen that the majority of residents have a positive attitude towards bicycles as a convenient and green means of transport(Figure 3-37).

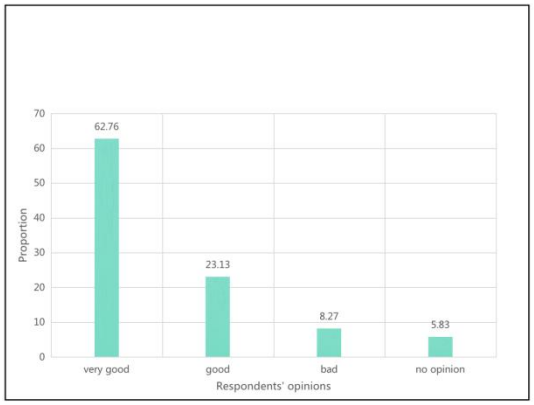

Figure 3-37 Proportion of evaluation of bicycles

Resources: Questionnaires

② What people say about walking (travel)

Attitudes towards walking are somewhat similar to those of cycling, with 68.23% of people giving a very positive view of pedestrian transport. Only 3.28% were against the development of pedestrian transport, so it seems that walking is the most direct way for people to get around the Racecourse plot(Figure 3-38).

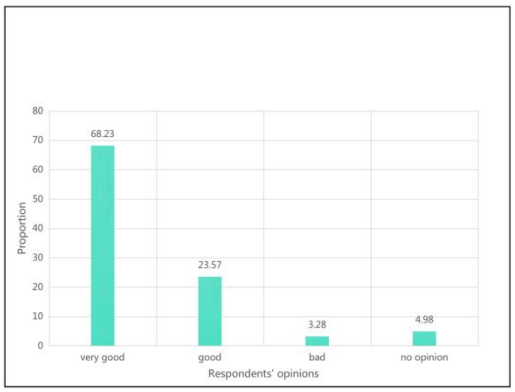

Figure 3-38 Proportion of evaluation of walking

Resources: Questionnaires

③ What people say about private cars (travel)

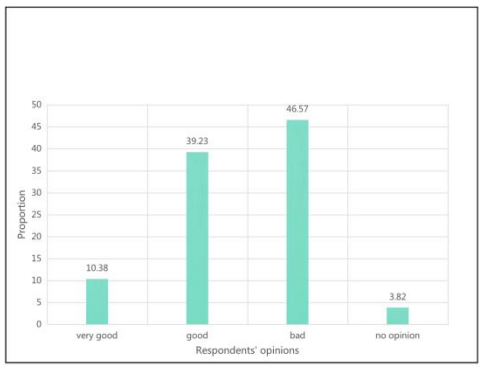

Figure 3-39 Proportion of evaluation of private cars

Resources: Questionnaires

People's attitudes towards private cars differed markedly from those of walking and cycling, with only 10.38% of people giving high approval to private car transport modes. Over 40% of the public believe that private car transport is not a good way to travel and should be controlled and regulated(Figure 3-39).

④ What people think is the ideal transport policy

From the survey on what people think is the ideal transport policy, almost 53% of residents think that public transport should be developed, another 35.65% think that bicycles should be developed and only 8.72% think that cars should be developed(Table 3-4). It can be seen that the majority of residents believe that public transport and slow traffic transport should be developed in the future.

Table 3-4 Transport policies considered desirable by the public in and around the Racecourse plot

（Resource：Questionnaire）

Transport modes should be developed	Slow traffic	Public Transport	Private Car	Other
Proportion	35.65	52.52	8.72	3.11

3.5 Problem statement

Through research on the current situation and the slow walking environment and people in and around the Racecourse plot, it is easy to see that the urban quality of the Racecourse plot is seriously out of step with the positioning of Zhujiang New Town, with neither a high quality urban space to attract people nor an effective slow walking system to dovetail with the surrounding area of the site. The urban renewal work is to solve the stock development, improve the urban quality and input new vitality to the old urban site. Through research, the problems of the Racecourse plot can be summarised in four points.

3.5.1 Inadequate construction of slow traffic road network

In earlier years, the traditional "car-oriented" urban transport planning and philosophy gave priority to the development of fast roads, making slow traffic a subsidiary of fast traffic. The Racecourse plot has undergone many changes, but no slow traffic network has been formed. From the research, it is not difficult to find that the Racecourse plot can not form a docking system with its surrounding areas, so that the urban slow movers can not effectively enter the Racecourse plot through the urban slow traffic network can not effectively introduce urban people, then can not make the Racecourse plot facilities to obtain economic benefits, to a certain extent, this also led to the Racecourse plot facilities through many times The Racecourse plot and its surroundings have been abandoned as a result of many changes. At the same time, due to historical planning factors, the scale of the neighbourhood is large,

resulting in a sparse network of slow-moving roads and a large distance between slow-moving trips, which reduces the convenience of slow-moving. The width of the slow-moving roads is not wide enough and motor vehicles occupy the slow-moving roads, resulting in congestion and poor road accessibility. This, coupled with the mixed traffic organisation of motorised and non-motorised traffic, makes the safety of slow-moving traffic a challenge.

3.5.2 Inadequate design of slow road nodes

Through the research, we can find that there is no slow traffic design within the Racecourse plot and its surrounding roads, except for the two urban arterial roads, Huacheng Avenue and Racecourse Road, which are relatively well-designed for slow traffic. Neither the roads nor the street crossing facilities within the Racecourse plot have been designed with slow traffic in mind, and are basically designed with the car at the core. To a large extent, this has resulted in a lack of willingness and purpose for people to enter the Racecourse plot for slow travel. A good design of the slow traffic nodes would attract people to slow down and stay, which is something that is seriously lacking in the Racecourse plot.

3.5.3 Uneven distribution of ancillary services

Taken together, the distribution of restaurants and shopping has a clear spatial aggregation that tends to cause slow-moving congestion locally. The businesses that are still active in the Racecourse plot include the Southern Furniture City and some internal food and beverage services. Car parking around these outlets occupies a large amount of urban space, which is very unfriendly to the travelling public and further reduces the existing urban quality of the Racecourse plot. In addition, within the Racecourse plot, the lack of supporting public service facilities, inadequate coverage of public service resources and poor accessibility of public service facilities due to the abandonment of most of the businesses, has a weak attraction to people's slow travel, which directly affects people's choice of slow traffic travel mode and subsequently brings about a reduction in the proportion of slow traffic travel and increases the possibility of motorised travel.

The outdoor sports and fitness exercise can absorb the crowd to walk slowly and stay, while the whole Racecourse plot is rich in space resources but not utilised, only the central green area is used as a golf course sports venue, but it is not open to the general public, only members can participate, such a lack of sports land layout leads to the distant community people do not have a reason to go out for walks and sports. The lack of sports space per capita is a serious shortage, and the lack of public space in the city reduces the proportion of people travelling around the area.

3.5.4 Poor environmental quality of slow traffic spaces

The space for slow-moving roads within the Racecourse plot is squeezed, and the infrastructure of the roads is inadequate, with a lack of basic service facilities such as leisure seating and shading devices. The roads and public spaces within the site are occupied by a large number of parking spaces, and the roads are seriously lacking in greenery and the paving is old and simple, affecting the aesthetics and viability of the slow-moving spaces. There is no urban public space for public activities, and the form of activity in the slow walking space becomes a pure rush, with no high quality space or landscape spots to attract the public to come here for activities and slow walking. The lack of spaces and activities for civic interaction reduces the vitality of the space and the chance of people participating in the slow walking movement.

3.6 Chapter summary

This chapter begins with a basic description of the Racecourse plot in the study area. Then the development process of the Racecourse plot is sorted out. It then investigates the urban spatial environment of the Racecourse plot, the slow-moving environment and the slow-moving people around the Racecourse plot. The current problems of the Racecourse plot in terms of urban design and the slow walking concept are summarised, and a direction is indicated for the subsequent case study and the summary of the urban design strategy for the slow walking concept.

Chapter 4: Case Studies

This chapter provides a case study of the urban design of slow traffic in urban areas in China and other major cities in the world that are similar to the Guangzhou Racecourse plot, and provides relevant experience for the design and research of slow traffic in the Guangzhou Racecourse plot through the analysis and study of urban slow traffic in the relevant cases. The selected cases are Manhattan district of New York, Shinjuku district of Tokyo, Central district of Hong Kong and Futian district of Shenzhen.

4.1 Manhattan, New York

1、Overview

Figure 4-1：Manhattan Location Map

Resource：www.nycisnot4sale.com

Manhattan is the central district of New York City. New York's famous Broadway, Wall Street, the Empire State Building, Greenwich Village, Central Park, the United Nations headquarters, the Metropolitan Museum of Art, the Metropolitan Opera House and other attractions are concentrated in Manhattan Island, making part of the island the CBD of New York. Here banks, insurance companies, exchanges and large companies headquartered in the cloud column, is the highest employment density in the world. With an area of about 24 square kilometers, the residential population reached 559,600 in 2000, with a population density of 23,300 people per square kilometer, and the number of jobs was about 2,013,600, with a job density of 84,000 jobs per square kilometer[57].

The Midtown and Lower Manhattan areas of Manhattan Island are home to Manhattan's

[57] Zhou Yang. Lower Manhattan, New York: A new urban foundation[J]. Landscape Architecture, 2013(02):78-85. doi:10.14085/j.fjyl.2013.02.018.

Central Business District, including the new Midtown business district and the financial district to the south, while the "Lower Manhattan area", the financial district to the south of Manhattan, is The Lower Manhattan area is the most central area of Manhattan's CBD. At approximately 2.6km2, it is the fourth largest central business district in the United States and is home to over 318,000 jobs[58]. The area is densely populated with tall buildings (Figure 4-2) and is home to large financial institutions and businesses such as the Wall Street Stock Exchange and the former World Trade Center.

Figure 4-2：Manhattan city view

Resource：https://www.timeout.com/newyork/manhattan

2、Traffic Planning Overview

Manhattan's road network is dense, with a uniform and regular grid (Figure 4-3), with each block measuring approximately 150 m by 75 m. The Henry Hudson Arterial to the west and the Franklin D. Roosevelt Arterial to the east are interconnected to form arterials around the island. In addition, all roads are one-way, except for a few arterials which are two-way, with limited on-street parking allowed on some roads. Manhattan has a sizeable and efficient public transportation system, which is a

Figure 4-3：Lower Manhattan Road Network

Resource：www.nycisnot4sale.com

[58] Tian Hui. Analysis of the impact of accessibility of urban parks on visitor flow - an example from Manhattan Island, New York[C]//Chinese Society of Landscape Architecture. Proceedings of the 2020 Annual Conference of the Chinese Society of Landscape Architecture and Gardening (Previous volume). China Construction Industry Press, 2020:4. DOI:10.26914/c.cnkihy.2020.056759.

prerequisite for the city's prosperity. A total of 11 subway lines (Figure 4-4) connect every neighborhood in Manhattan; 40 bus lines (Figure 4-5) run throughout the island, and most of the connections to the surrounding areas of Brooklyn and New Jersey are by land and water (PATH trains and ferries); and there is a helicopter station that provides air connections.

Figure 4-4：Lower Manhattan Subway Network

Resource：www.nycisnot4sale.com

Figure 4-5：Lower Manhattan Bus Lines

Resource：www.nycisnot4sale.com

3、Slow traffic System

New York City 2021 general population data show that people in the Hatton area commute by subway or rail, bus, car, walking, and ferry, accounting for about 51%, 11%, 12%, and 26%, respectively, and ferry use is so small as to be almost negligible[59]. It can be seen that the top travel modes are public transportation and walking, and the proportion of travel by these two types of modes is nearly 90%, and the proportion of travel by car is very small. As an important mode of transportation that connects with the public transportation system in Manhattan, the slow walking system has been highly valued by New York's urban planning and transportation management departments for its environmental friendliness, energy

[59] Urban transportation systems of 25 global cities Elements of success 2021

efficiency, and health benefits, and they have developed various measures to ensure the smooth operation of the slow walking system. In terms of bicycle systems, Manhattan has a proven system to encourage greater use of the bicycle system:

① Establishing a more comprehensive island-wide bicycle network system and a *Greenway* system around Manhattan Island;

② Provide bicycle parking and support facilities at appropriate locations in the city;

③ Improved bicycle accessibility at bridges and stations；

④ Take various measures to ensure the safety of riders；

⑤ In addition, we have adopted policies to institutionalize bicycle transportation in public institutions and private organizations.

After years of development, New York has established a multi-level bicycle transportation network and developed a detailed bicycle route map (Figure 4-6), which classifies bicycle routes into three levels of comfort, guiding people to choose their routes more conveniently when traveling by bicycle. The continued improvement of the bicycle road network provides a solid foundation for New York City's Bike Share program, which was launched in 2009, and by 2021, there will be hundreds of bike rental locations in Manhattan, making it easier for people to use bicycles to get around.

Figure 4-6：Lower Manhattan Bike Route

Resource：http://www.nyc.gov/html/dcp/

The Bicycle & Ride bus transfer system is also being implemented in the borough, with an effort to create a 20-minute bicycle loop in the borough. In addition, some subway lines are allowing bicycles to be brought in during off-peak hours, making bicycle transportation in Manhattan faster, safer and more comfortable.

In terms of pedestrian systems, almost all of the large and small roads in the Manhattan

district have established walking paths, which are combined with the restaurants and retail on the first floors of the surrounding buildings, effectively enhancing the vitality of the entire district. To provide more convenience for pedestrians, three-dimensional trail systems are also used in the Manhattan area (Figure 4-7)[60]. Manhattan's high population density and small space objectively create a highly developed public transportation system in Manhattan CBD, and the developed public transportation system and the high concentration of urban public services and supporting facilities make most of the living needs can be solved within walking and riding range, which makes working and living in Manhattan CBD very convenient, avoiding traffic congestion and automobile exhaust pollution, and saving the energy consumption required for living.

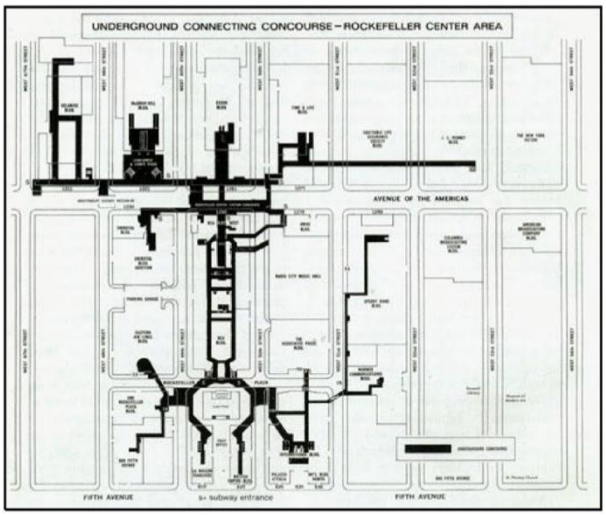

Figure 4-7：Rockefeller Center Underground Walkway

Resource：https://foursquare.com/

However, it should be noted that the pedestrian environment within Manhattan is not ideal, as the road system in the area follows the structure of the carriage era road network, the design of the pedestrian system is lagging behind, the phenomenon of mixed pedestrian and vehicular traffic is serious, there is a lack of internal greenery, and the internal open space is fragmented and small. The dense public transportation network and small neighborhood character of Manhattan's CBD provide an objective basis for pedestrian-led surface transportation, but they also pose a corresponding problem in that the overly dense road network fragments neighborhoods too much, severely affecting the continuity of the pedestrian system. To ameliorate these problems, New York has initiated a plan to *recreate streets for people*.[61] The plan is to create a 30-mile network of no-motorized streets in Manhattan - a *green network* - with appropriate amenities, public seating, trees, fountains, street-side coffee and vendor stands, and a dedicated security force to secure the area, creating

[60] Wei, An-Min. Study on the planning strategy of slow walking system in CBD area[D]. Tianjin University, 2012.

[61] The livable City Transport Plan, www.auto-free.org/4yrplan.html

a walkable and attractive pedestrian-friendly business district.

4.2 Shinjuku, Tokyo

1、 Overview

The Shinjuku district is located 15km west of the center of Tokyo, about 8km from Ginza, and is one of the major sub-centers of the city. The Shinjuku is a fan-shaped site west of Shinjuku Station (Figure 4-8), with a total area of approximately 96 hectares, and consists of three main parts: the super high-rise area, the Nishi-guchi Plaza and its underground part, and Shinjuku Central Park. The total development site is about 50hm2, including 16.4m2 for super high-rise buildings, and the planned employment population is about 300,000. 1991 marked the completion of the implementation of the Shinjuku district in its entirety with the completion of the Tokyo Metropolitan Government Building, which took about 25 years[62]. Today, the Shinjuku CBD has become one of the most important business centers in Tokyo, with facilities comparable to those in the three districts of the Tokyo Metropolitan Center, covering economic, administrative, commercial, cultural, and information fields.

Figure 4-8：Shinjuku-ku Map Resource：Google Earth

2、 Traffic Planning Overview

The Shinjuku district is centered around a large integrated transportation hub located in the heart of Shinjuku, a major westbound transportation node in Tokyo with several subway lines and JR lines passing through it, including the Marunouchi, Shinjuku and Oedo lines, and with a daily passenger flow of 3.47 million, the highest in the world[63]. In addition, many of

[62] Li Jianxin,Wang Xue. The experience of synergistic development between Japanese rail transit stations and their surroundings: the example of Shinjuku Station[J]. Shanghai Urban Planning,2021(05):110-115.

[63] Chai D,Ye Xafei,Wang Zhi,Xiang Lei. Characteristics of peak coefficients of high cross-sections of urban rail traffic in

Tokyo's major rail lines divide their trains into different classes such as General, Express and Limited Express. Such train operations provide more efficient rail services for users with different travel distances, making it possible for workers here to live farther away.

The road traffic system of Shinjuku district also has a radial structure with Shinjuku Junction Station as the core (Figure 4-9), and is characterized by a dense inner circle and a sparse outer circle. In the inner circle near Shinjuku Station, the road network is dense and more conducive to pedestrian travel; in the outer circle, the road network is slightly less dense, but the road system is three-dimensional and provides sufficient separation of pedestrian and vehicle traffic. The three-dimensional road network is closely connected to the rail, public bus, parking and pedestrian networks, forming an efficient interchange network.

Figure 4-9：Dense rail lines connecting Shinjuku with the surrounding areas

Resource：www.tokyometro.jp

3、Slow traffic System

The transportation plan of Shinjuku district is highly three-dimensional and strictly separates pedestrian and vehicular traffic, and it has successfully achieved a perfect connection between the slow traffic system and the public transportation system[64]. Since Shinjuku is a small area,

Japan[J]. Urban Rail Transit Research,2019,22(09):113-116+126.DOI:10.16037/j.1007-869x.2019.09.026.

[64] Zhou Jiangao, Tang Xiaodong. TOD construction and inspiration of Tokyo's rail hub[J]. China Famous Cities,2022,36(04):23-30.DOI:10.19924/j.cnki.1674-4144.2022.04.004.

its slow traffic system can meet most of its needs mainly by its pedestrian system, and therefore, its slow traffic system is also mainly referred to its pedestrian system.

By analyzing the important slow-moving traffic nodes in Shinjuku (including Nishi-guchi Plaza, Minami-guchi, Times Square and Central Park), the planning and design strategies for its pedestrian system can be summarized as follows.：

（1）A three-dimensional pedestrian network. In Shinjuku CBD, a three-dimensional pedestrian system has been designed at several important slow-moving nuclei. For example, the underground space of Shinjuku West Exit Plaza (Figure 4-10) is designed with two underground levels and three partial levels; the bus stop and return yard is arranged at the ground level to provide a transfer function with the pedestrian flow; the skywalk is installed at a height of 7 meters from the ground level and is used to create an organic connection between Shinjuku Station and the main commercial buildings, creating a complete and complex pedestrian network.

Figure 4-10：Nishiguchi Plaza, Shinjuku-ku
Resource：https://www.nippon.com/

（2）The pedestrian system is integrated with commercial and recreational facilities. Many of the pedestrian paths in the Shinjuku CBD have facilities such as retail stores and restaurants serving pedestrians on one side or both sides, or are set up in succession to form commercial streets to enhance the convenience and attractiveness of pedestrian traffic, while adding to the overall vitality of the area.

Figure 4-11：South Exit Plaza, Shinjuku-ku
Resource：https://mooool.com/

For example, the Southern-Terrace pedestrian plaza at the south entrance of Shinjuku (Figure 4-11) connects major buildings in the vicinity, such as Shinjuku Station and Times Square, into an architectural complex, and a number of retail stores and restaurants are located around the plaza, creating a *pedestrian paradise* with a comfortable and pleasant space.

（3）Multi-level slow-moving landscape

A slow-moving landscape with a rich spatial hierarchy by utilizing the height difference of the ground Central Park in the western part of Shinjuku CBD is the main open space and an important slow-moving recreation area in the area. The park is designed to link the three main parts of the park as a whole by installing pedestrian bridges with staggered heights, taking advantage of the height of the road surface (Figure 4-12).

Figure 4-12：Shinjuku-ku Park
Resource：http://kokorography.com/

It is worth mentioning that Shinjuku CBD has made the best use of underground pedestrian space, with its most groundbreaking underground space development, the Metropolitan Underground Walkway, which connects the commercial spaces on the east and west sides of Shinjuku Station to form an underground pedestrian commercial system with a total of 110,000 ㎡ of construction.

4.3 Central, Hong Kong

1、Overview

Central, Hong Kong, located in the west-central part of the north shore of Hong Kong Island, with Tsim Sha Tsui and Victoria Harbour to the north, has been the commercial and administrative center of Hong Kong since its inception. After more than 100 years of

development, Central now ranks as a world-class CBD, with a large number of multinational corporations involved in finance, insurance, real estate, and business services headquartered in this area. The famous Government Hill is home to these administrative agencies. The Central CBD covers an area of 1.53 square kilometers with a total floor area of more than 4 million m2.

Figure 4-13：Central, Hong Kong
Resource：http://www.xiongmao.hk

As the financial and administrative center of Hong Kong, the Central CBD is the true *heart of Hong Kong* with its excellent location, efficient transportation system, and comprehensive infrastructure[65].

2、Traffic System Overview

Hong Kong Central has a well-developed external transportation system dominated by expressways, railways and water transport. Its interior is a hilly road network structure with free form and high road network density. The most important thing is to focus on public transportation. Thanks to the high-density urban form of the ribbon formed in accordance with natural conditions and the strong support of the Hong Kong government, Central has built a super-developed public transportation network that is second to none in the world, with a large number of bus light rail and subway crossing the central area, making this the best accessibility in Hong Kong. Over 90% of people use public transportation when they go out, a high percentage that is the highest in the world.

Rail, road and ferry transport together form the public transport system in Central (Figure 4-14). Rail transport mainly includes the MTR, trams and the Peak Tram, road transport mainly includes various types of franchised buses, public light buses and cabs, and non-franchised buses providing feeder services to rail stations, while ferry transport mainly

[65] Jin Jun, QI Kang, ZHANG Jingyu, ZHANG Man. Evaluation and analysis of compactness quantification in urban central areas - a comparative study between Zhujiang New Town of Guangzhou and Central of Hong Kong[J]. Urban Planning,2018,42(06):47-56.

consists of nine internal routes in Hong Kong and one external route to Macau. According to the Hong Kong Transport Department, as of the end of 2010, the average daily number of public transport passengers in Hong Kong was 11.6 million, of which rail transport carried about 36%, other land transport (franchised buses, public light buses, cabs and non-franchised buses, etc.) accounted for about 60% of the total passenger traffic, and the remaining proportion was made up of marine transport[66].

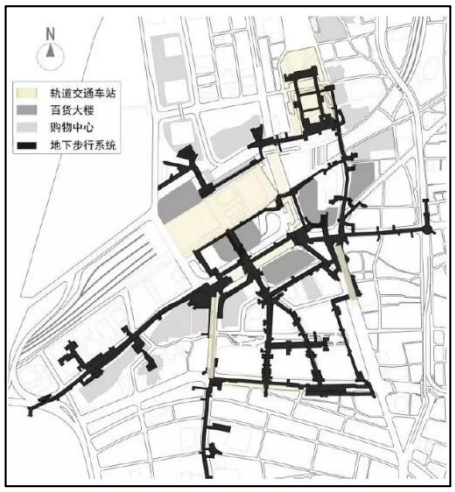

Figure 4-14：Hong Kong's slow traffic system

Resource：http://www.xiongmao.hk

3、Slow traffic System

As Hong Kong Island, where Central is located, consists mainly of hilly terrain with relatively undulating and variable topography, and because government policy does not promote the use of bicycles, the use of bicycles in the Central area's slow traffic system is not common. Therefore, its slow walking system mainly refers to its pedestrian system[67]. Like other mature CBDs in developed countries, a well-developed public transportation system needs to be complemented by a well-developed pedestrian network, and the Central

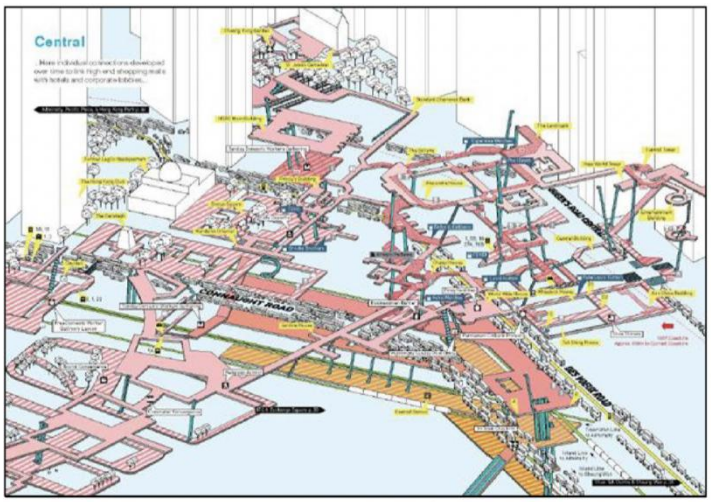

Figure 4-15：Hong Kong's three-dimensional walking system

Resource：http://www.tod-center.com/

[66] Hong Kong Transport Department Statistics:http://www.td.gov.hk/sc/transport_in_hong_kong/transport_figures/passenger_journeys/index.html

[67] Zhang Lingzhu,Qing Anlan. Application of three-dimensional spatial network analysis to pedestrian systems in high-density city centres - an example from the Central district of Hong Kong[J]. International Urban Planning,2019,34(01):46-53.

CBD is built with a complex pedestrian system using the concept of traffic cube and pedestrian-vehicle separation (Figure 4-15). The specific implementation is as follows: underground level - connects the rail stations and parking lots through underground walkways; ground level - connects the bus stations and rail station entrances with pedestrian walkways to facilitate quick interchange; upper level - connects the building corridors, overpasses, terraces and other air walkways in an orderly manner to form a system network (this is the most unique aspect of the Central CBD pedestrian system); the three different levels of the pedestrian network are organically connected through the installation of escalators, stairs, elevators and other facilities, and the clever design is combined with the architectural vocabulary, natural and humanistic landscape.

The Central CBD connects the entire three-dimensional pedestrian system to the commercial facilities, which not only increases pedestrian vitality and stimulates commercial activity, but also allows for more efficient gathering and evacuation of people from the associated buildings, while relieving the traffic intensity of the surface roads and avoiding mixed pedestrian and vehicular traffic, making pedestrian travel very convenient.

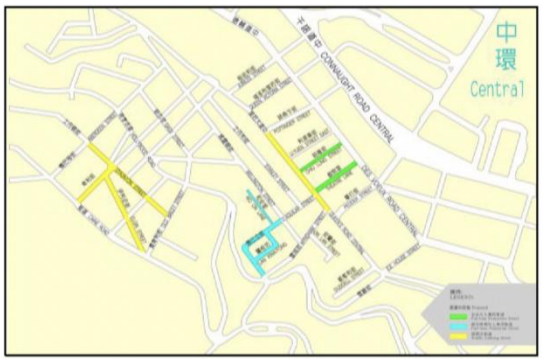

Figure 4-16：Hong Kong's three-dimensional walkway improvements
Resource：www.td.gov.hk

The Hong Kong Transport Department attaches great importance to the development of the pedestrian system. To promote walking and to improve the pedestrian environment and safety, a Pedestrian Environment Improvement Plan for the Central CBD was formulated in 2001, with the following key elements.：

① Full-day pedestrian-only access is provided at Theatre Lane and Chao Lung Street, with full priority for pedestrian traffic in this area. No motorized vehicles allowed except for

vehicles providing emergency services and some delivery trucks；

② Part-time pedestrian-only streets will be set up in D'Aguilar Street, Lan Kwai Fong and Queensway. In these areas, vehicles will only be allowed to drive during designated hours and there will be no on-street parking spaces, although loading and unloading areas will be provided for loading and unloading passengers and cargo.

③ Converting the Queen's Road Central footpath at the rear into a leisurely street where the pedestrian path will be widened and parking will be minimized, and traffic reduction measures such as speed bumps and narrow lanes will be implemented.

4.4 Futian, Shenzhen

1、Overview

The Futian Central District is located in Futian District, Shenzhen, with Lotus Hill to the north and Shenzhen Bay to the south, with a total land area of about 4.1km^2. The southern area is an urban business centre with financial, trade, information and commercial retail functions, the Futian CBD (Figure 4-17), which covers an area of about 2.3km^2 and is surrounded by high-rise residential areas[68].

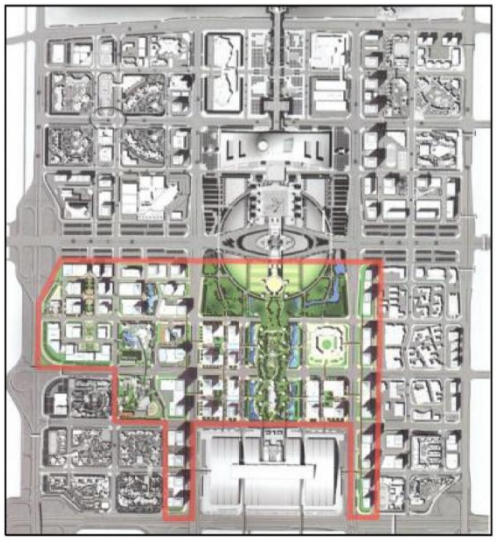

Figure 4-17：Shenzhen Futian Layout

Resource：Self-drawn by the author

2、Overview of the traffic system

The Futian CBD has a grid-like road system (Figure 4-17) with trunk road spacing of approximately 600m, mostly using interchanges to direct traffic flow at intersections. The spacing of the road network in the area, including branch roads, is approximately 200 x 200m.

[68] Zhang Xiaochun, Shao Yuan, Huang Qixiang, Yi Chen Yu. From early and pilot implementation to early demonstration--Historical practice and future prospect of integrated transportation system development in Shenzhen SAR in 40 years[J]. Urban Transportation,2021,19(01):48-57.DOI:10.13813/j.cn11-5141/u.2021.0104.

The external traffic links of the region are mainly based on the main roads, while the internal motor traffic flows are mainly guided by secondary roads and feeder roads.

In terms of rail transport, there are two planned metro lines passing through the area, with a total of five stations, all of which are connected to planned bus hubs or terminal stations, forming a three-dimensional public transport network. In the CBD core area, pedestrian and vehicular traffic is organised using the principle of "vertical diversion", with pedestrian activities mainly concentrated on the first floor or in the underground pedestrian system, avoiding interference with motor vehicle traffic. A comprehensive underground space system has been planned for the densely developed Futian CBD area.

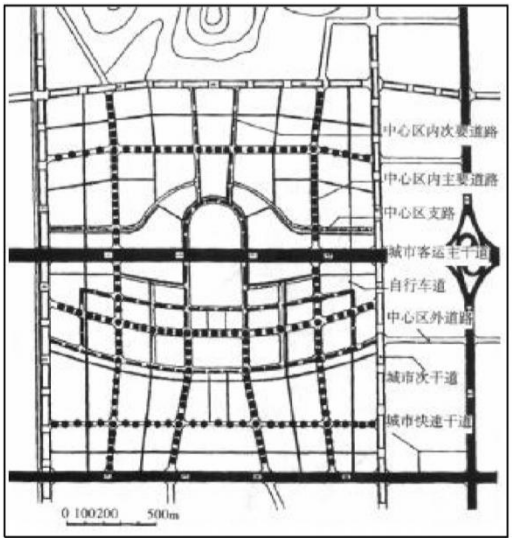

Figure 4-18：Shenzhen Futian Traffic Plan

Resource：Tsinghua and Tongji program design booklet

3、Slow traffic systems

With a population of over a million, Futian is the city's central business district and a hub for commerce, culture, and technology. The Fountainhead slow-moving system can be summarized in the following aspects：

(1) Infrastructure and connectivity aspects

① The slow traffic system in Futian District consists of pedestrian walkways, dedicated bicycle lanes, and green corridors. These networks enable safe and convenient movement for pedestrians and cyclists. Key features include:

② Well-maintained sidewalks: Adequate width, proper lighting, and ramp access for wheelchair users and strollers.

③ Bicycle lanes: Separated from motor vehicle lanes by physical barriers, ensuring cyclist safety.

④ Green corridors: Integrating greenery and natural elements into the urban environment, providing shade, and improving air quality.

(2) Public Transport Integration aspects

① The Futian District's slow traffic system is well integrated with public transport, with easy access to metro stations, bus stops, and taxi stands. This integration promotes the use of public transport and encourages residents to walk or cycle for shorter distances.

② Futian District offers numerous public spaces, such as parks, squares, and plazas, providing ample opportunities for social interaction and leisure activities. These spaces are well-connected by the slow traffic system, making them accessible and enjoyable for residents.

(3) Design aspects

① Accessibility and Safety: Futian District's slow traffic system prioritizes pedestrian and cyclist safety with well-maintained sidewalks, separated bicycle lanes, and green corridors. The design emphasizes universal access, accommodating wheelchair users, and strollers with ramps and smooth surfaces.

② Connectivity: The system features seamless connections between different slow traffic modes, such as pedestrian walkways and bike lanes. It also integrates well with public transportation, encouraging multimodal travel and reducing reliance on private vehicles.

③ Public Spaces: Futian District's design incorporates a variety of public spaces, like parks, squares, and plazas, fostering social interactions and improving residents' quality of life.

(4) Management aspects

① Maintenance: The management of the slow traffic system in Futian District is characterized by periodic maintenance, including pavement repairs, lighting improvements, and vegetation control. However, some areas still require more consistent and timely attention.

② Bicycle Parking: While the district provides some bicycle parking facilities, demand often exceeds supply, leading to illegal parking and cluttered sidewalks. Improved management and expansion of these facilities could alleviate these issues.

③ Enforcement: Traffic regulations and safety measures, such as speed limits and pedestrian crossings, are essential for the slow traffic system's success. Enhanced enforcement could further ensure compliance and minimize conflicts between different road users.

(5) Policy and Planning aspects

① Vision: Futian District has a clear vision for promoting sustainable development and reducing automobile dependence through effective slow traffic system planning and implementation.

② Stakeholder Engagement: Policymakers actively engage with stakeholders, including residents, businesses, and transportation agencies, to address concerns and gather input on the slow traffic system's development.

③ Continuous Improvement: Futian District continually reviews and updates its policies and plans, incorporating lessons learned from previous projects and adapting to changing needs and demands.

By the end of October 2022, the total mileage of non-motorised roads in Shenzhen was

3,180.7 kilometres (in both directions), an increase of over 2,200 kilometres compared to the end of 2016. *During the 14th Five-Year Plan* period, Shenzhen will continue to implement the requirements of the municipal government's practical work on people's livelihood and build no less than 300 kilometres of non-motorised roads every year to create a slow-moving traffic-friendly city.

4.5 Summary of the experience of China and foreign countries urban slow traffic

Through the analysis of the above-mentioned slow traffic systems in famous Chinese and foreign cities, we can see that all countries attach great importance to slow traffic in urban centers, and the perfection of slow traffic systems is an extremely important factor influencing the success or failure of the overall traffic planning and design of cities.

In terms of pedestrian system, pedestrian travel can enhance urban vitality, reduce energy consumption, achieve the goal of energy saving and emission reduction, and is the key to connect with other transportation systems in the city center area. The above case studies shows that there are three main modes in the planning of pedestrian system in urban center area：

(1) To establish special pedestrian paths, pedestrian areas or a system of dedicated pedestrian paths that are dynamically controlled over time.

(2) Developing a three-dimensional pedestrian system and separating pedestrian and vehicular traffic by means of aerial walkways, building corridors, building terraces, pedestrian bridges and underground passages will not only improve the overall traffic efficiency of the city center, but also enhance walkability and safety.

(3) Integrating the pedestrian system with commerce and combining it with retail, restaurant and other commercial services to create an underground commercial pedestrian

street and enhance the attractiveness and vitality of the underground trail.

A well-planned and well-developed pedestrian system in urban centers can bring vitality and generate economic and social benefits for the development of urban centers. Tokyo's Shinjuku and Hong Kong's Central are classic examples of successful pedestrian-vehicle segregation and the development of three-dimensional integrated pedestrian networks.

In terms of bicycle systems, major cities around the world have been paying more and more attention to its role and strengthening its construction due to its convenience, health and non-polluting characteristics, plus its advantages such as its ability to effectively expand the connection range of public transportation networks in urban centers. China has seen rapid development of bicycle sharing in various cities in recent years, and is at the forefront of urban bicycle transportation in the world.

Firstly, the distances between streets in urban centres are within the ideal range for cycling and the combined benefits of cycling for longer walking distances are significant; secondly, due to the flexible and compact nature of cycling, it takes up fewer transport resources in terms of cycling and parking and offers unique advantages when interchanging with more distant public transport stations[69]. Against the backdrop of low-carbon and energy-saving initiatives in countries around the world, what was once seen as a backward mode of transport has now begun to make a comeback. For example, New York's Manhattan borough has established a comprehensive bicycle system with rational cycling routes and a large number of public bicycle rental facilities and bicycle storage facilities； In China, for example, the Futian in Shenzhen has been planning a separate cycling road system since the late 1980s, separating motor and non-motorised traffic, and now there is a greenway system along the central green belt in the urban with excellent cycling conditions. In the context of the continuous optimisation of the slow-moving system, Shenzhen has become a "cycling fever".

[69] He Yang, Wang Leyi, Wang Xiang, Wen Yongqi. The experience of domestic and international slow transport development[J]. Urban Public Transport,2019(02):31-34.

According to the Shenzhen Transport Bureau, there are currently 420,000 bicycle sharing bikes in Shenzhen, with 29.11 million registered users. By the end of September 2022, the cumulative number of shared bicycle rides in Shenzhen had reached 280 million, with the average daily ridership increasing by about 1.5 times compared to the pre-Covid-19 pandemic period.

In addition, all famous cities have placed a lot of emphasis on the design of slow walking systems and other transport connections. For example, in Tokyo's Shinjuku district, there are 24 rail stations within less than 1km2, making the stations much more accessible. To improve accessibility on foot, lifts and escalators have been installed in all major urban centres, and bicycle parking has been enhanced in the vicinity of interchange stations. In some regions, there are even policies in place to allow the bringing of private bicycles into public transport systems, such as *New York's Bikes on Transit*, a special regulations document for bringing bicycles into public transport, which specifies the times, routes and ways to bring bicycles into public transport. Shenzhen also launched the Shenzhen Bicycle Transport Development Plan (2021-2035) in 2020, which clearly states that bicycle transport is an important part of the comprehensive transport system and is as important as other modes of transport. The city will build a high-quality bicycle transportation system that is "safe, continuous, convenient and comfortable", and create a "bicycle-friendly city".

4.6 Chapter summary

This chapter analyses the slow-moving systems of selected urban areas in major cities in China and the world with similar situations to the Racecourse plot. The analysis outlines the traffic profile and slow traffic system of each case. The slow traffic systems in urban centres similar to the Guangzhou Racecourse plot are summarised and concluded, comparing the slow traffic systems in cities in China and developed countries. It provides some experience and theoretical basis for summarising the research of urban design strategies under the concept of slow traffic, and also provides a reference experience for finalising the research of the urban design of the Racecourse plot under the concept of slow-moving traffic

Chapter 5: Urban Design Strategies Under the Concept of Slow Traffic

The use of slow-moving traffic in Chinese urban design is not about controlling urban sprawl or increasing the proportion of slow travel in the city, but about controlling the objectives and integrating them into the culture of the city. Therefore, the slow-moving traffic urban, or '*slow traffic + urban space*', is a combination of traffic mode and urban, but it is also a way of integrating a 'slow' spirit into the development of urban space and urban life. In this chapter, the principles and objectives of the urban design of the slow-moving concept, the urban road network, the urban slow-moving space and the urban slow-moving nodes will be researched respectively.

5.1 Principles and Objectives of Urban Design for Slow Mobility Concepts

5.1.1 Design aims

1、Safety

The slow traffic system in the city is responsible for high intensity and high density traffic flow, especially at the bus stops and rail stations and other traffic nodes where a large number of passengers converge, in addition to the high intensity motor traffic flow and the slow traffic flow on the ground there are inevitable cross-conflicts, the goal of the safety of the slow traffic system is to prevent congestion accidents within the high intensity slow traffic flow itself and to prevent mixing with motor traffic and The goal of safety in the slow-moving system is to prevent congestion accidents within the high-intensity slow-moving traffic flow itself and to prevent conflicts with motorised traffic, so that safety must come first.

2、Efficiency

As an engine of economic development, efficient operation is one of the characteristics that cities must have. In particular, for commuting and business-oriented work-related slow-moving needs, the slow-moving system is responsible for direct travel and close

connections with public transport, and the ultimate aim of these travel activities is to achieve rapid movement of people.

3、Convenience

It is human nature to seek convenience, and an urban slow-moving system should provide optimal accessibility and convenience within the city. This requires a rational organisation of the city's slow traffic to form a convenient, fast and organic network that provides easy access between the various functional sites, buildings, facilities and traffic distribution points within the city.

4、Comfort

In contrast to the work-related demands of the city, the non-work-related demands place higher demands on the quality of the spatial environment of the urban slow walking system. For example, slow traffic activities such as commercial shopping, tourism and leisure, residential recreation, are more focused on the experience of slow traffic activities, and a comfortable and pleasant slow traffic environment with interesting and aesthetic facilities is the main demand for slow traffic systems. Slow cities should also provide a comfortable slow walking experience for urban slow walkers to attract people to slow walking activities.

5.1.2 Design principles

The urban design of the slow traffic Concept should be based on the following principles：

（1）Principle of safety

Urban slow traffic gives priority to ensuring the safety of pedestrian and cycle traffic users, ensuring space for passage, adopting a variety of means of segregation, using physical segregation wherever possible, without guardrails or delineation instead, and the safety of pedestrian and cycle traffic users should be considered in the design and maintenance of pedestrian crossing facilities, street lighting, municipal networks and streets, ensuring space for passage and environmental quality, coherence and comfort. Combine the surrounding architectural landscape with shade trees and greenery, lighting, street furniture, signage and

accessibility and other supporting facilities to provide shade and rain protection wherever possible to improve comfort and service levels[70] .

（2）The principle of relevance

Slow traffic can only be effectively linked between functional units in a city if there are a variety of connections. For example, the degree of association between two residential units is much smaller than that between residential and commercial units, so it is difficult to link slow walking behaviour through similar urban units and to generate interaction or social behaviour. The construction of a variety of urban slow traffic linkages, connected by a slow traffic system, creates a slow traffic network that activates the activities of the city's inhabitants and organically connects the various units in the city.

"In cities, there must be sufficient density and a close diversity of connected spaces to make the city vibrant[71]." In the spatial structure of the city, individual small urban units form an associative structure connected by a large number of slow-moving spaces, and urban units are not connected by their proximity to each other (Figure 5-1). Therefore residents will rarely generate slow walking activities between similar urban units.

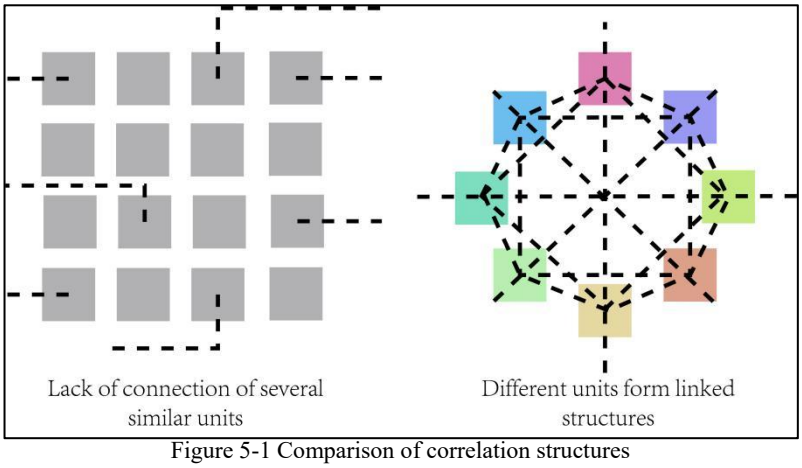

Figure 5-1 Comparison of correlation structures

Resource：made by the author

Building an orderly multi-level slow walking network system, a grid-like urban spatial structure and forming a diverse urban associative structure is what allows residents to experience a rich urban life through urban public activities.

[70] PENG Yuhong, ZHU Hongjia, XIE Zhen. Reflections on countermeasures for the development of slow walking system in high-density urban development areas[J]. Traffic and Transportation,2022,35(S1):270-274.

[71] Zhang Qiang. Study on the landscape design of urban traffic road slow walking system [J/OL]. Highway,2023(03):294-299 [2023-03-29].

（3）Principle of accessibility

Slow walking in cities is about building green and safe pedestrian or non-motorised systems to achieve the goal of 'slowing down', thus creating more public activities and a comfortable spatial atmosphere, but chronic walkers have a limit to reach their destinations by walking and non-motorised vehicles, so the main principle of creating 'slow walking' in urban spaces is 'accessibility', within the limits of what the slow walker can physically handle, to reach their destinations easily.

5.2 Design strategies for slow-moving urban road networks

5.2.1 Slow moving areas

Slow moving areas are areas where urban space is cut by wide arterial roads (such as expressways, two-way 6-lane roads and above) and railroads and rivers, making it difficult for slow-moving traffic to cross and inhibiting their departure (transit) trips[72]. When establishing slow traffic areas, factors such as the scale of the corresponding urban area, land type, road network structure, natural landscape and the dominant range of slow traffic activities need to be taken into comprehensive consideration, and slow traffic activities should be arranged within a single slow traffic area as far as possible in order to reduce the generation of slow traffic behaviors across slow traffic areas. Within a single slow traffic area in the relevant urban area, travel distances are relatively short due to the absence of street or river crossings obstructing travel, and travel using the slow traffic system has absolute advantages[73].

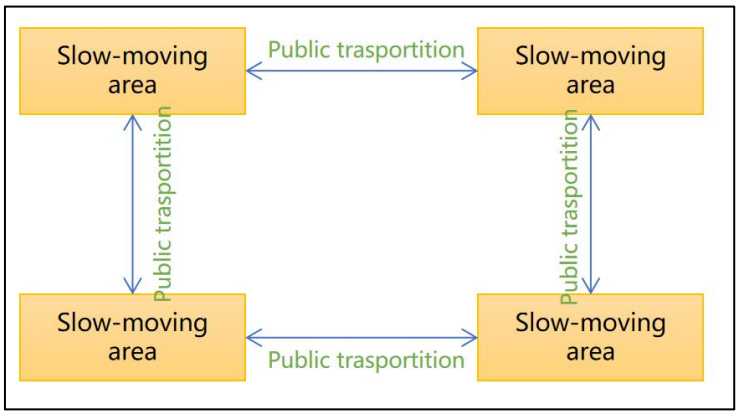

Figure 5-2 Urban slow moving area concept

Resource：made by the author

[72] Chen Mengzhou. Analysis of the impact of urban roads on the segmentation of slow-moving space[J]. Traffic and Transport,2021,34(S1):206-210.

[73] By Pan Haishao. Rapid Transit and Urban Development in Metropolitan Areas [M]. Shanghai: Tongji University Press, 2002.

In the early planning of urban areas, the idea of giving priority to the development of slow-moving systems should be fully established, the density of road networks should be reasonably set, the scale of large and small blocks should be determined, the mixed use of land should be strengthened, relevant service facilities to meet the daily work, life, leisure and recreation of people in the area should be integrated within a single slow-moving area, a comfortable and beautiful slow-moving space should be built, a perfect public transport connection network should be constructed, and a "*slow-moving + public transport*" mode of development should be actively guided. The urban design of the Guangzhou Racecourse plot in the context of urban renewal is an opportunity to put this concept into practice.

The average range of cyclists and pedestrians would be 3.14km^2 and 19.63km^2 respectively if the size of the slow-moving area were to be kept within the range of 1km and 25km respectively, which, as we have seen from the case studies, is far less than the overall scale of development in most large urban centres around the world. This means that it is virtually impossible to avoid a large amount of pedestrian and bicycle traffic crossing the slow-moving area in urban centres without a fully segregated pedestrian/vehicle development pattern. Therefore, inter-district connectivity of the pedestrian and cycle road network is essential, requiring a network of dedicated slow corridors between slow traffic areas and the provision of reasonable crossing facilities at inter-district junctions.

5.2.2 Design strategy for the layout of the pedestrian road network

Due to the high cost and scarcity of land in cities, land use is often intensive and intensive, while the influx of motorised traffic and the high intensity of pedestrian traffic distribution often make it difficult to meet the demands of both the limited road resources and slow traffic space in cities[74]

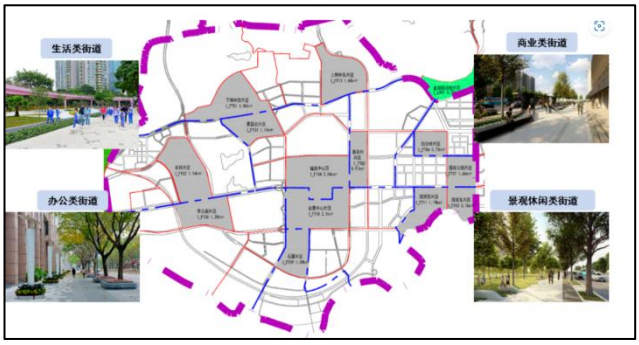

Figure 5-3 Shenzhen Futian pedestrian path layout strategy Resource：https://www.sznews.com/

[74] By Nikos A. Salingaros. Principles of urban structure [M]. Beijing: China Construction Industry Press,2011:130-150.

In particular, the access to high-grade urban roads inevitably hinders or even fragments the slow traffic network in urban centres; conversely, too many at-grade pedestrian crossings can have a negative impact on the efficient operation of road traffic in urban centres. In response to these problems, a three-dimensional pedestrian system has emerged. This three-dimensional pedestrian transport model consists of three main manifestations: underground, above-ground and aerial pedestrian systems[75]. This thesis focuses on above-ground and aerial pedestrian systems.

1、Ground level pedestrian network planning strategy

Establish a multi-level pedestrian road network to provide a multi-level walking experience. In principle, all roads within the city centre should be equipped with footpaths. Pedestrian paths can be planned and installed according to local conditions at three levels: pedestrian corridors, pedestrian walkways and pedestrian leisure paths（Figure 5-4）.

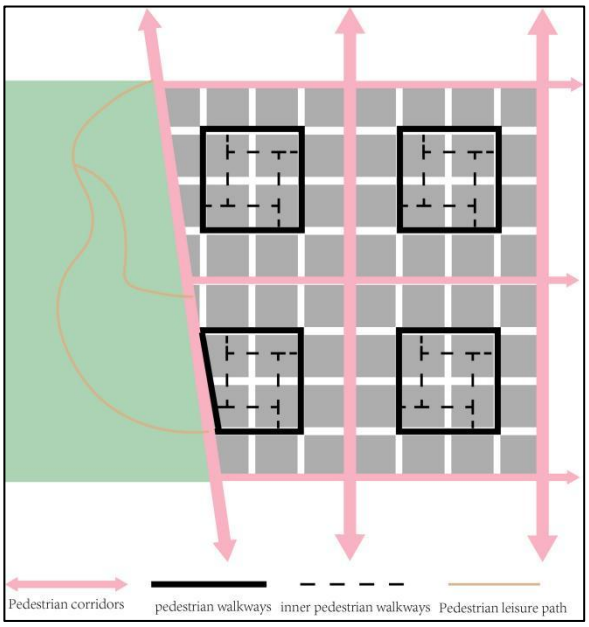

Figure 5-4 Pedestrian network planning strategy

Resource：made by the author

（1）Pedestrian corridors

The pedestrian corridor is the main undertaking for a large amount of pedestrian traffic within the city centre and is the main pedestrian network of the slow walking system in the city centre. Its planning principles are：

① Provide a safe, comfortable and fast walking environment and fast connection ways for pedestrians through pedestrian corridors that connect high-intensity slow-moving cores with public transport stations in the urban centre；

[75] By Sun Liang. Urban Pedestrianization - A Study of Urban Design Strategies [M]. Nanjing: Southeast University Press, 2012.

② In order to avoid conflicts with motor traffic, the main choice is to give priority to the installation of feeder roads and secondary roads in the city centre, while in the installation of urban expressways and main roads through the city centre, attention should be paid to the installation of machine-office separation areas；

③ When setting up roads with commercial functions, care should be taken to ensure both the traffic distribution function of pedestrians and the interaction function of people with each other.

（2）pedestrian walkways

Pedestrian walkways are the second most important pedestrians in the pedestrian system after the pedestrian corridors, with high accessibility. The planning principles are：

① Bridging the gaps between the pedestrian corridor network and increasing pedestrian accessibility within the slow traffic areas；

② It connects the more important slow-moving nuclei and public transport stations within the city's Slow moving areas；

③ General roads all can be set up, but if the accessibility of the road is high priority can be given to cut arterial roads.

（3）Pedestrian leisure path

Some research has shown that when walking time to open space is less than 3 minutes, there is a significant increase in communication between people on foot. In Melbourne, known as the "*Garden State*," city-specific plans require that all homes be located ≤200 m from open spaces, even though these public spaces may only be a pocket park[76]. In Paris, the service radius of green spaces is also used as an important criterion to test the appropriateness of their

[76] By Yoshinobu Ashihara. The aesthetics of the street [M]. Tianjin: Baihua Wenyi Publishing House, 2006.

layout. The plan defines the size of green spaces and their service radius in detail, as shown in Table 5-1, which defines the service area of public green spaces, beyond which residents are considered far away from the green space and inaccessible[77].

Table 5-1 Public green space service radius

(Resource: Urban Pedestrianization -A Study of Urban Design Strategies)

Green space scale (hm^2)	<0.25	0.25~10	10~30	>30
Service Radius (m)	50	250	500	1000

Therefore, public green spaces in urban centers should be designed to cover most of the core area, where recreational walking paths can be established to provide walking space for people to get close to nature and increase their interaction with people. In areas that are not covered by public green space or are difficult to reach on foot, such as the Zhujiang New Town, highly accessible recreational trails are needed to provide ample space for recreation (e.g., the Manhattan waterfront trail shown in Figure 5-5). The principles of pedestrian recreation trail planning are：

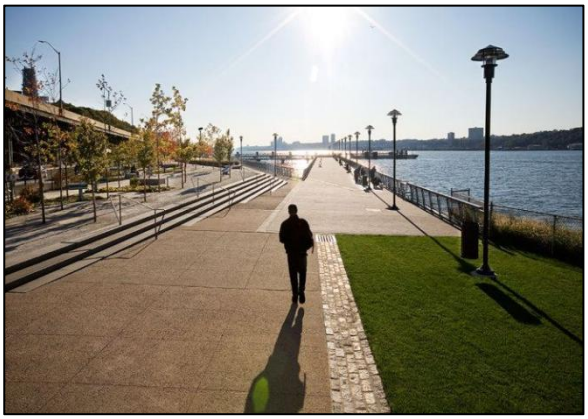

Figure 5-5 Manhattan waterfront trail

Resource：Architecture Landscape.com

① Installed along public green areas, waterways or greenways to connect major slow-moving cores with natural open spaces；

② In the peripheral areas of urban blocks that are far from the main green areas, the

[77] Lv Zhixiong. Study on the Shaping of Slow Walking Space in Urban Communities under the Green Concept[D]. Southwest Jiaotong University, 2016.

planning and construction specifications should be raised appropriately to form a belt-like public space；

③ It should be located away from main roads and urban expressways, and provide leisure seating, artistic lighting, landscape vignettes and other compositional elements that add artistry and interest.

2、Aerial pedestrian system planning strategy

Aerial pedestrian systems are now widely used in large cities around the world to address the problem of high intensity urban pedestrian and vehicular traffic, and are playing an increasingly prominent role in improving the urban transport environment and enhancing the pedestrian advantage. Aerial pedestrian systems are suitable for pedestrian traffic between different buildings, greatly increasing the accessibility of buildings connected to the trail system, and also creating a rich landscape hierarchy for the pedestrian path (Figure 5-6). In planning and design, reference can be made to the well-established skywalk systems in cities such as Central in Hong Kong and Shenzhen. The design principles：

Figure 5-6 New York City Skywalk

Resource：Architecture Landscape.com

① Combine different building functions and spatial characteristics to set up a high-quality air walkway system with beautiful shapes；

② Through stairs, elevators, escalators and other facilities with different buildings, flyovers, tunnels and public spaces, green spaces, etc. to form a good connection, to achieve the systematization and continuity of the air walking network；

③ The airwalk can be arranged in combination with commercial, dining and entertainment facilities, while appropriate amenities can be arranged on both sides to increase vitality and attractiveness；

④ Establish convenient connections with other urban transportation systems, such as urban trails, rail stations, and bus stops, to ensure efficient and smooth pedestrian transportation;

⑤ Strengthen humanized design, set clear and unambiguous signs and guidance services, create a safe, clean and comfortable walking environment, and provide a safe and pleasant place for pedestrians to stay and rest;

⑥ Establish an incentive mechanism for private construction of three-dimensional slow traffication facilities to avoid difficulties in financing construction;

⑦ Integrate good greening landscape and humanistic landscape elements in the design of the aerial pedestrian system to enrich or enhance the overall urban cultural connotation of the city center.

Figure 5-7 Shenzhen Longgang bike path layout

Resource：http://pnr.sz.gov.cn/

5.2.3 Bicycle road network layout design strategy

Nowadays, bicycle sharing has become one of the important ways to solve slow traffic in Chinese cities. In order to provide bicyclists with more efficient and better quality cycling facilities, a multi-level bicycle-specific backbone road network should be established, which can be divided into three levels

including arterials, access roads and recreational paths according to their functional characteristics (Table 5-2). In general, all roads in urban blocks and their associated areas should have bicycle lanes.

Table 5-2 Bicycle road width (Resource:Urban road design specification)

Type	Function Positioning	Recommended Bicycle Lane Width（m）
Bicycle arterials	Main skeleton of urban bicycle lanes, interfacing with Slow moving areas	3.0-6.5
Bicycle access	Important bicycle distribution and connection access	2.5-4.0
Bicycle Recreation Path	Scenic sightseeing and fitness bike paths	2.5-3.5

（1）Bicycle arterials

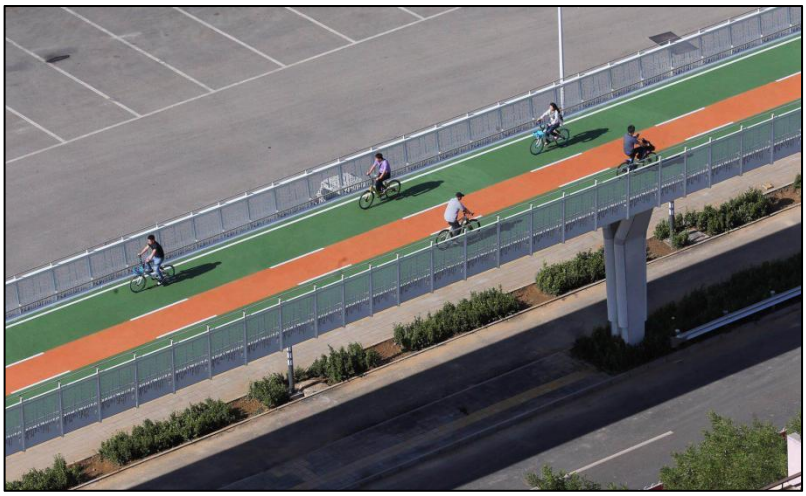

Figure 5-8 Beijing bicycle arterials
Resource：https://tech.ifeng.com/

Bicycle arterials are the most important bicycle corridors in urban neighborhoods, forming the backbone of the bicycle road network in urban neighborhoods and surrounding areas, linking the Slow moving areas inside the neighborhoods with the bicycle road network outside them, and meeting the large number of cycling demands in the area. The planning and design principles are：

① Connections to the network of cycle arterials in outlying urban areas；

② Connected to all Slow moving areas within the blocks themselves;

③ Connecting key slow-moving nodes in the block to major public transport stops, ensuring easy interchange between cyclists and public transport stops;

④ In order to avoid conflicts with motor traffic, the main choice is to give priority to the installation of branch roads and secondary roads in the city, while in the urban expressway and main roads through the urban area, attention should be paid to the installation of motor and non-motorized segregation area.

（2）Bicycle access roads

The bicycle access is second only to the bicycle arterial in the downtown area and is primarily responsible for conveying bicycle traffic to the bicycle arterial and bicycle recreation paths.

The planning principles are：

① Bridging gaps between bicycle arterials networks and increasing accessibility between Slow moving areas within the city center;

② Connecting the more important slow-moving core, rail stations and bus stops in the area;

③ All general roads can be set up, but priority is given to roads with higher accessibility, which can be main roads.

（3）Bicycle recreation path

Manhattan and Shenzhen have already established corresponding bicycle lanes for recreation, with the main functions of sightseeing, exercise and recreational cycling in their internal areas (also available for walking). The planning

Figure 5-9 Shenzhen bicycle recreation paths

Resource：https://epaper.oeeee.com/

principles are：

① It should be set away from the main roads and urban expressways, along the water system, public green space and other natural landscape conditions in the area or with humanistic features, so that it will form a convenient connection between the important slow-moving core and parks, green spaces, waterfronts and other open spaces；

② Active creation of diverse cycling and activity spaces with winding paths or undulating slopes to add artistic and interesting components；

③ The cycling route should form a sightseeing loop to guarantee different cycling distances and different cycling times for leisure needs.

5.3 Design strategies for slow traffic urban spaces

5.3.1 Slow moving core design strategies

1、Classification of slow-moving cores

The urban slow traffic core is a lower level of slow traffic area after the slow traffic area, an area within the slow traffic area where the intensity of slow traffic, such as walking and cycling, generates a high level of attraction. The nucleus reflects the dominant function of the slow traffic area and is the 'magnetic point' for slow traffic activities, where a large volume of slow traffic is concentrated[78].

Figure 5-10 Slow Moving Core Classification

Resource：Made by the author

In urban areas, slow-moving cores generally include：

① Public transportation core - public transportation hubs and their effective radiation

[78] Li Ye. Interpretation of the Shanghai Slow-Moving Traffic System Plan [J]. Construction Science and Technology,2009(17):56-59.

areas, including urban and intercity rail stations and large bus interchange sites, etc.;

② Dynamic core - high-density business and administrative office areas, large cultural and sports facilities and (primary and secondary) school campuses, etc.;

③ Leisure core - open space areas such as park green areas and waterfront leisure areas;

④ Living core - highly dense residential communities, high-end hotels, etc.

The focus of the planning and design of the slow traffic system is to shape attractive characteristic slow traffic agglomerations in the city with elaborate slow traffic core design, so as to attract people to integrate into the slow traffic system and reduce the use of small cars, thus changing people's travel at the level of ideology.

2、Planning strategies for slow cores

To strengthen the vitality of public space in urban areas, it is necessary to enhance the priority level of road use by slow walkers within the slow traffic core, to form a slow traffic space with safety and convenience as the basic functions, and to create a pleasant environmental quality to enhance the attractiveness of slow traffic so as to curb the development of small car traffic. The slow traffic strategy of the slow traffic core needs to be tailored according to different dominant functions and targeted.

（1）Public transportation hub core

① Land use

The slow core of the public transportation hub provides the necessary place facilities for the connection between the slow system and large-capacity public transportation, and the strategies that can be adopted at the land use level include: the mixed function development of the land around the station, and the comprehensive setting of business, commercial and

residential functions; the optimization of the efficiency of the interchange function through three-dimensional space development.

② Traffic organization

There are two main ways to improve the interchange experience between slow-moving and public transportation: first, to provide slow-moving passageways for crossing streets in conjunction with interchange building spaces; second, to reasonably arrange bicycle storage facilities at hubs to provide an orderly and safe interchange environment for the "B+R" transportation mode.

③ Associated Facilities

Improve the slow passage, optimize the guidance signs and slow flow lines to enhance the accessibility of slow travel; focus on the construction of barrier-free facilities, taking into account the needs of the disabled, the elderly and the young; strengthen the construction of humanized information dissemination and guidance system.

（2）Dynamic core

① Land use

Most of the urban dynamic cores concentrate business offices, commercial retail, leisure and entertainment and other related functions. Slow walkers using these functions pay more attention to the experience of the slow traffic activity itself and need the support of high quality slow traffic environment, therefore, the development of mixed functions should be strengthened in land use, and the construction of public environment and open space should be emphasized, and special design should be carried out in combination with specific functional sites in order to maintain the continuity and interestingness of slow traffic space.

② Traffic organization

The policy of "slow traffic priority" is fully implemented, and the slow traffic network in the nucleus is organically sorted out to make it a comfortable and pleasant slow traffic system; in

addition, spatial and temporal dynamic control measures can be taken in necessary areas at necessary times to set up special pedestrian areas.

③ Associated facilities

slow traffic facilities support need to be planned in a high standard and unified manner, combined with artificial and natural green landscape to build a pleasant and continuous slow traffic road network. Set up a concise and clear signage system and provide sufficient convenience facilities.

（3）Leisure Core

① Land use

The urban leisure core is the concentration of the city's main natural and humanistic landscapes, an important place for slow walkers to get close to nature and take a leisurely rest, and its land layout should be combined with the overall function setting of the corresponding area of the city. The construction of parks, green areas, squares and other open spaces should be designed according to the historical and cultural characteristics of the city and the characteristics of human needs, providing ideal spaces for people to interact outdoors and meeting their psychological and spiritual needs.

② Traffic organization

In terms of traffic organization, a human-oriented, quiet and safe slow walking space should be created by improving the construction of public transportation on the periphery of the leisure nucleus and using traffic control to isolate the intrusion of motorized traffic. At the same time, the organization of slow walking routes should pay attention to harmonize with artistic and interesting landscape settings, focus on the interactive relationship between people and scenery, and strengthen the experience of dialogue and communication between people and natural space.

③ Related facilities

The slow traffic facilities should be combined with the needs of landscape and environmental design, reasonably arranged at appropriate locations, and their design should reflect the beauty of regional characteristics and harmoniously blend with the overall surrounding spatial environment.

（4）Living core

① Land use

The urban living core gathers residential buildings with high development intensity and is an important source of urban slow traffic generation. For such areas, it is also advisable to implement a mixed land use strategy, combining with commercial, leisure and office functions, so that occupants' needs for various public services can be obtained within the reach of slow traffic, and setting up special walking paths and connecting with urban open space, so that occupants can easily contact nature.

② Traffic organization

A convenient slow road network and a high-quality slow walking environment should be established within the core, and a convenient connection should be formed between the slow traffic system within the living core and the slow traffic system in other areas outside the core to reduce the need for long-distance travel, and a comfortable, exquisite and safe network of slow traffic spaces should be constructed through physical pedestrian-vehicle separation and manual controlled pedestrian-vehicle separation measures.

③ Related facilities

Strengthen the installation of fitness and leisure equipment, as well as the construction of facilities that enhance the quality of the environment, such as public seats and artistic lighting; the planning and construction of bicycle parking sites, and strengthen management measures to ensure the safety of bicycle parking.

5.3.2 Slow traffic connections and interchange strategies

1、Increase station density and entrance/exit density

Generally speaking, the degree of development of a certain transportation system in a region is judged by the density of its line network, and the higher the density of the line network, the more developed the transportation system is. For urban centers, where the land area is relatively small but the construction intensity is unusually high, the accessibility of public transportation stations, especially rail stations, directly affects the convenience of slow travel in urban centers. There is no doubt that when the density of the public transportation system and the connecting radiation range match the reachable range of the slow travel system, it will make it more convenient for slow travelers to enjoy efficient public transportation services.

By using "small stations" instead of "large stations" and "large number" instead of "large scale" to set up stations in urban centers, especially rail transit stations to optimize the layout, and at the same time, combined with business, commercial buildings and street crossing facilities, to increase the density of station entrances and exits, so that the slow movers can enjoy the convenient and fast services brought by public transportation within a suitable distance.

2、Interchange strategy

For an urban center area like the Zhujiang New Town Racecourse plot, an efficient and convenient public transportation hub fast and slow connection strategy plays an important role in the efficient operation of the passenger transportation system. The articulation strategy of public transportation and slow traffic connection should be reflected in the following three aspects：

（1） Three-dimensional development and design

As the accessibility center of urban public transportation system, the city center emphasizes fast and efficient interchange, which requires public transportation stations to provide efficient and convenient interchange conditions for interchange passenger flow. The public

transportation hubs in the world's most famous cities, such as the aforementioned Hong Kong Central and Tokyo Shinjuku, have been developed in a three-dimensional way, using the comprehensive development concept of "commercial + transportation hub", so that the slow-moving passenger flow can be efficiently transferred in the three-dimensional space with slow-moving channels, thus reducing the impact on the external slow-moving space of the city. The impact of the slow-moving space is reduced.In addition, the accessibility of the slow-moving network at different levels is improved through the use of convenient vertical transportation equipment such as elevators, escalators and walkways, thus providing a more humane and convenient slow-moving service for slow walkers.

（2）Rail station hall crossing design

There is a need to strengthen the design of rail station lobby crossing. Guangzhou Zhujiang New Town area rail transit station slow traffic volume, traffic congestion is prominent, its nearby city arterial road also usually exists in the strong demand for pedestrian crossing, in the construction of rail transit station, should be combined with the rail station entrances and exits set available for crossing the function of the transfer hall and pedestrian passage, so that slow movers more convenient to transfer, but also can be used in the pedestrian crossing traffic is not large when it can also be used as This can avoid the waste of resources caused by setting up separate slow crossing facilities and save investment costs, while enhancing the convenience and safety of slow movers.

（3）Convenient bicycle connection design

Bicycle sharing has become increasingly popular in China due to the advantages of using bicycle + public transportation to increase the service coverage of rail stations. The future development of China's cities will see more and more demand for bicycle interchange. Therefore, attention should be paid to the design of bicycle quick access at public transportation stations. A related study in Saga Prefecture, Japan, shows that the ideal distance people can walk to a rail transit station after parking is generally 50~100 m (acceptable to

more than 70% of people)[79]. The layout of bicycle access facilities should be located within 100 meters from the entrance/exit of the rail station or bus stop, and reserve appropriate spare space for long-term development as far as possible.

In addition, bicycles can be introduced directly into subways or buses in appropriate areas by staggering peak hours, specifying specific routes and bicycle sizes, and providing bicycle storage facilities in appropriate locations on the cars to facilitate bicycle travelers. For example, Manhattan in New York and Downtown in London allow folding bicycles to be taken on light rail and trams during off-peak hours.

5.4 Design strategies for slow-moving urban nodes

The design layout of the slow traffic nodes plays a crucial role in the operational efficiency and safety of the slow traffic system, which mainly includes the connection point between the slow traffic system and the public transportation system, the slow crossing facility point and the public bicycle service point.

5.4.1 Layout strategy for cycle parking and public cycle points

Common measures that can be used to address the cycling traffic situation in the city include the planning and design of three-dimensional cycle parking facilities, either underground, above ground or above ground, within or around general buildings in the city, or around major open spaces with

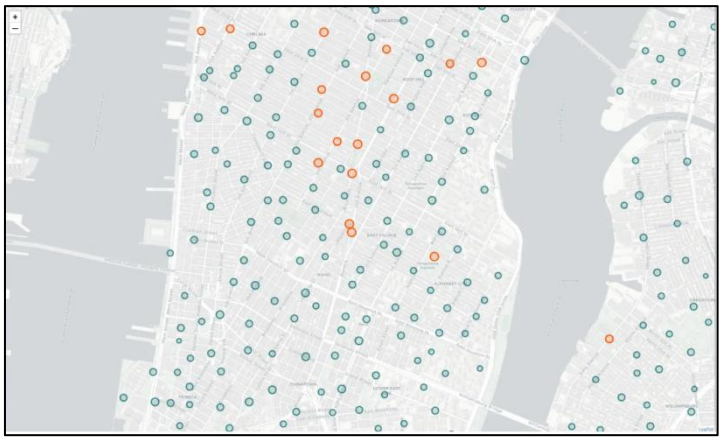

Figure 5-11 Manhattan Bike Station Distribution

Resource：Photo by the author

[79] Wang Yong. The logical closure of the spatial form of "station-city integration" in Japanese rail transit hubs[J]. DOI:10.13616/j.cnki.gcjsysj.2021.03.224.

semi-enclosed cycle parking facilities. Simplified on-street cycle parking can be provided in the peripheral areas of urban neighbourhoods, but with enhanced cycle security features such as artistic cycle locking racks.

Figure 5-12 Guangzhou Bicycle Parking Spot

Resource：Photo by the author

The demand for work and non-work cycling in the city is becoming increasingly strong and already provides a solid user base for the development of public bicycle rental services. At the same time, the development of public bicycle rental services in the urban is indispensable in order to intensify the development of bicycle parking resources while providing convenient bicycle services for the public to encourage more cycling trips. Copenhagen, London, Paris, Hangzhou and other cities in China and abroad have an early start on bicycle rental services. Their planning experience and technical specifications can be used as reference.

The principles for planning the layout of urban bicycle sharing points are：

① Parking points for shared bicycles should be set up at the main entrances and exits of urban rail transit stations, and their distance from the entrances and exits should be limited to about 100 metres；

② Bicycle rental points should be located 30-40 metres from bus stops with many routes and high pedestrian traffic, in conjunction with the pavement, but with sufficient space for pedestrian traffic, approximately 2-3 metres；

③ It is advisable to set up rental points in cycle corridors and cycle recreation paths in

urban core areas, with a spacing of no more than 1.5 and 2 kilometres respectively, and closely integrated with the natural landscape to beautify the natural environment；

④ Based on the basic principles of site conservation and integration with the landscape, the bicycle parking points are located in areas that are not easily accessible to pedestrians, such as road green belts and municipal amenity belts.

Table 5-3 Guidelines for bicycle parking in downtown Guangzhou

(Resource:Guangzhou street design full elements)

No.	Type		Length	Width
1	In-line	single	2.0m	0.6m
		double	3.2m	
2	60° diagonally	single	1.7m	0.5m
	aligned	double	3.0m	
3	45° diagonally	single	1.4m	
	aligned	double	2.4m	
4	30° diagonally	single	1.0m	
	aligned	double	1.8m	

5.4.2 Layout strategy for pedestrian crossing facilities

As previously analysed, the high intensity of building development and mixed functions in urban centres has led to the creation of frequent slow-moving activities, which in microcosm manifests itself in the large number of slow-moving crossing demands at CBD road intersections and road sections. The Urban Road Traffic Planning and Design Code (GB50688-2011), issued by the Ministry of Construction in 2019, stipulates that the spacing between pedestrian crossings

Figure 5-13 Shenzhen pedestrian crossing

Resource：https://www.dutenews.com/

or street crossings should be 250-300 m[80]. However, due to the high intensity of land use in the city and the dense population in the area, the spacing between street crossings should be small and the crossings should be installed more frequently.

A comparison of the spacing of street crossings on major traffic arteries in large, established urban centres around the world using Google Earth software provides a rough idea of their reasonable spacing. For example, First Avenue in the eastern part of Manhattan, New York, is a north-south, two-way, six-lane traffic artery in the eastern part of the district, with a relatively even distribution of crossing facilities in general. The average crossing spacing is about 217m, while the average crossing spacing of Des Voeux Road Central, located to the south, is only 161m; the famous Champs Elysees in the heart of Paris, but with an average crossing spacing of 84m, also provides a good example to follow. This shows that the spacing between slow-moving crossings is less than 200m in the vast majority of large, mature cities, and less than 100m in more humane, dense arrangements.

In contrast, in China, the Century Avenue Sky Corridor in Lujiazui, Shanghai, has a crossing facility of about 275 metres, while its longest crossing distance is over 600 metres; the East Bridge Road in Chaoyang, Beijing, has a crossing facility with an average spacing of about 300 metres and a maximum spacing of over 550 metres, while the East Third Ring Expressway, which runs through the city's neighbourhoods, has a lack of crossing facilities, with an average spacing of about 400 metres and a longest crossing distance of over 570 The longest crossing distance is over 570 metres[81]. The spacing between crossing

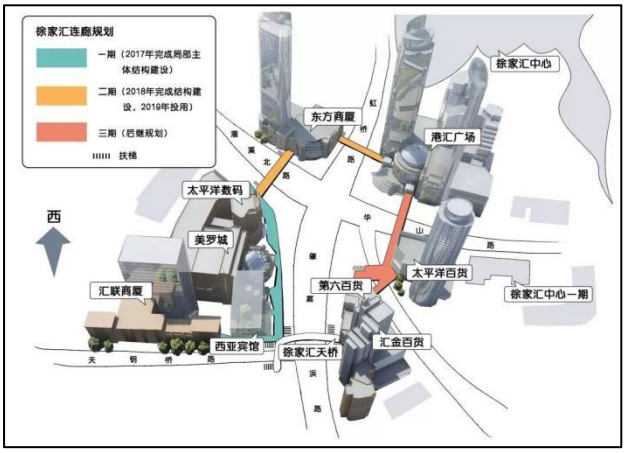

Figure 5-14 Shanghai Lujiazui Pedestrian Skywalk Design

Resource：https://www.dutenews.com/

[80] Ministry of Housing and Urban-Rural Development. Design specification for urban road engineering CJJ 37-2012 (2016 edition) [Z]. 2016.

[81] Ren Hongbo. Suggestions for further improving the slow traffic network in Shanghai[J]. Tunnels and Rail Transportation,

facilities in urban centres in China is too high and the lack of secondary crossing design for at-grade crossings makes it dangerous for pedestrians to cross.

In summary, large city center area crossing facilities should be densely arranged, while considering a variety of forms of installation, such as the combination of road center greening set secondary crossing safety island, in the rail station hall design integrated pedestrian crossing function, as well as in the setting of air walkway integrated commercial entertainment facilities and other forms. In the planning and design, the corresponding form will be selected to be arranged separately or form a three-dimensional crossing system.

5.5 Design strategies for slow-moving urban environments

5.5.1 Traffic Safety Measures

To ensure the safety and comfort of slow walkers, to meet their psychological safety needs and to limit vehicle emissions and noise, traffic calming design ideas should also be introduced to further regulate the behaviour of car enhancers, urging them to be aware of and courteous to slow movers[82]. In Manhattan, New York, for example, a number of traffic

Figure 5-15 Road safety measures: Raising the pavement in the Netherlands

Resource：http://www.maitu.cc/

Figure 5-16 Road tranquillity measures: road variant sections

Resource：https://hart.amsterdam/nl/

calming initiatives have been undertaken to improve the safety and vitality of the city's slow-moving traffic. The traffic engineering treatments are divided into four main categories: vertical, horizontal, signage and landscaping, which are translated into specific treatments

2021(01):1-3+60. DOI:10.13547/j.cnki.dxgcysd.2021.01.001.

[82] Li Yuan. Research on the planning and design of transportation system in the neighborhood system environment[D]. Chang'an University,2017.

such as speed bumps, raised pedestrian crossings, bottlenecks at intersections and other speed limits.

5.5.2 Optimal design of slow traffic guidance

From a "people-oriented" perspective, in addition to the optimisation of slow-moving traffic facilities and their layout, the design of intersections can also be optimised through the design of slow-moving traffic guidance. The following techniques are commonly used：

1、Adding signal control

The vast majority of intersections in China do not have signal control measures for right turns, and motor vehicles can still turn right during red lights, which causes a certain degree of machine-non-machine conflict and impedes the continuity of slow-moving traffic. Therefore, signals can be installed at slow-moving intersections in densely populated areas, so that the prohibition of right-turning motor vehicles during red lights can ensure the dispersal and smooth flow of slow-moving traffic.

2、Reduced right turn radius

Too large a right turn radius will lead to excessive speed when motor vehicles turn right, causing conflicts with slow-moving people and posing safety hazards. Therefore, an appropriate reduction in the turning radius to about 20 metres will not only protect the turning needs of large vehicles, but also reduce motor vehicle speed and ensure the safety of slow-moving people on their journeys.

3、Enlarge the corner stopping area

Larger corner stopping spaces can be reserved at intersections with high slow traffic intensities for pedestrians waiting to cross the street. This will prevent pedestrians from venturing into the motorway, reducing traffic chaos at intersections and improving accessibility and safety.

5.5.3 Dynamic management of slow traffic

To cope with traffic flows that may exceed the capacity of the slow-moving facilities, dynamic management measures can be taken where necessary to ensure the effective functioning of the city's slow-moving system.

In some cycle lanes where there is high cycle traffic but insufficient road width, cyclists' access can be ensured by providing a borrowable cycle lane during peak hours. This can be achieved by physically separating motorised traffic from non-motorised traffic by equidistant barriers, with the 1.5m area to the left of the barrier designated for cycling during peak periods, and reverting to motorised traffic after peak periods. This method avoids the risk of bicycles occupying the motorway and prevents motor vehicles from encroaching on the bicycle lane, killing two birds with one stone.

In addition, in order to cope with the overload of slow-moving pedestrians during holidays, temporary use of part of the motorway can be considered as a channel to ease pedestrian traffic, using manual or automatic lifting bollards to effectively extend the slow-moving space, such as the pedestrian evacuation trail in Manhattan; or the implementation of traffic control measures at specific times, setting up pedestrian-only areas in high-intensity pedestrian areas or pedestrian nuclei at specific times, and prohibiting motor vehicles from entering . Examples include the "Pedestrian Paradise" initiative on the pavements of Ginza Street in Tokyo during peak holiday periods, and a similar dynamic pedestrian traffic management initiative in Central, Hong Kong, which temporarily transforms an entire block into a pedestrian area during specific times of the day by imposing controls.

Figure 5-17 Manhattan Dynamic Sidewalks

Resource：https://hart.amsterdam/nl/

6. Chapter summary

This chapter examines the planning and design of urban slow traffic from four aspects: road network planning and design, traffic facilities planning and design, street space planning and design, and road material planning and design. The zoning classification and network supporting facilities for pedestrian and cycling road networks are established by studying the planning of slow traffic road networks. The study of pedestrian traffic, bicycle traffic, slow crossing facilities, bicycle parking, public bicycle rental, and facilities for interchange points, based on the different side categories of urban slow traffic facilities, helps to guide the design process. The study of pedestrian streets, alleyways, micro-parks and public squares, and shared streets helps to refine the design details of slow-moving traffic street spaces.

Chapter 6: Urban Design Implementation of the Slow Traffic Concept for the Racecourse plot

6.1 Logical Framework

6.1.1 Relevant design basis

(1) The importance of developing slow traffic in the context of urban renewal

Urban renewal is an important strategy to promote high-quality urban development in China's new era.slow traffic mainly consists of pedestrian and non-motorised traffic. In 2021, the Ministry of Housing and Urban-Rural Development and the State Administration of Market Supervision and Management jointly issued the Planning Standards for Urban Pedestrian and Bicycle Transportation Systems, which positioned pedestrian transportation as the basic mode of transportation for urban residents and bicycle transportation as one of the important modes of transportation for urban residents. It is clearly stated that urban transport should give priority to pedestrians, improve the travel environment for residents, ensure travel safety and promote green travel, with the intention of reversing the long-standing situation of urban transport being dominated by cars and promoting slow traffic as a means of solving urban traffic congestion[83]. As a stock development site in Guangzhou's Zhujiang New Town, the urban design for the Racecourse plot should not be like the old car-centric design mode in the context of urban renewal. Slow-moving traffic occupies an absolutely important proportion in urban transportation and is an important part of urban life. The concept of slow traffic as a concept of urban design to attract more people to the Racecourse plot is more in line with the context of urban renewal and the spirit of development of the times.

（2）The Racecourse in Zhujiang New Town

The design site of this thesis, the Racecourse, is located in the northeast of Zhujiang New Town. In March 2022, Guangzhou's 14th Five-Year Plan proposed to make Zhujiang New Town a window of high quality development for Guangzhou and a model for the new vitality

[83] Gu Fuyong. Analysis of urban road traffic planning and design under the concept of slow traffic [J]. Science and Technology Information,2022,20(11):59-61. doi:10.16661/j.cnki.1672-3791.2112-5042-4510.

of the old city. The Racecourse plot will be strategically located between Guangzhou's future CBD: Zhujiang New Town, Guangzhou International Financial Center and Pazhou Business District. The urban renewal of the Racecourse plot can provide Guangzhou with a higher level of urban vitality (Figure 6-1). At the current stage, the internal traffic of the Racecourse plot is isolated from the external urban space, which cannot attract more people to enter the internal part of the Racecourse plot and cannot stimulate the urban vitality of the Racecourse plot. Through the urban design of the slow traffic concept, a new path of urban development is provided for the Racecourse plot. This is in line with the spirit of urban renewal and will provide a higher quality urban living environment for the people of Guangzhou. The slow traffic concept is also a reflection of the concept of people-oriented urban design.

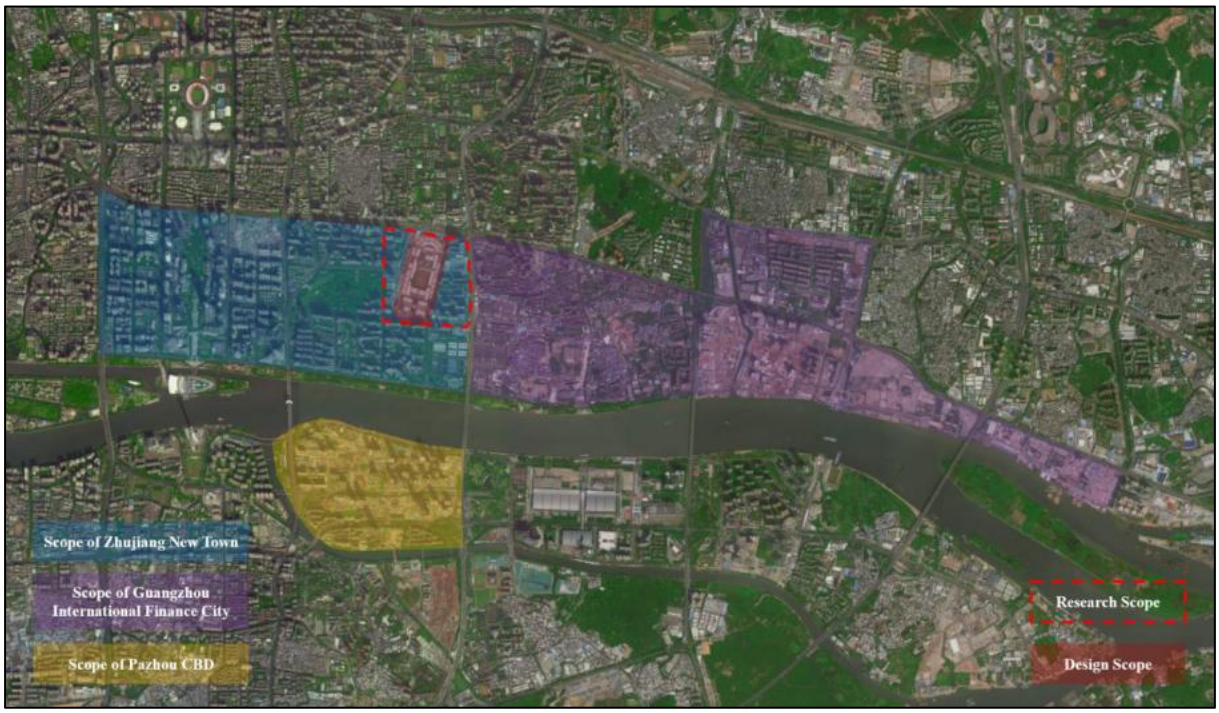

Figure 6-1 Map of the future planning area of the Racecourse plot Resources: Self-drawn by the author

（3）Establishment of Slow moving areas and urban design of slow-moving concepts

It is clear from the previous research that Slow moving areas are areas where urban space is cut by wide arterial roads (such as expressways, two-way 6-lane roads and above), railways and rivers, making it difficult for slow-moving traffic to cross and inhibiting their departure (transit) trips. The Racecourse plot is surrounded by main and secondary urban roads, and the

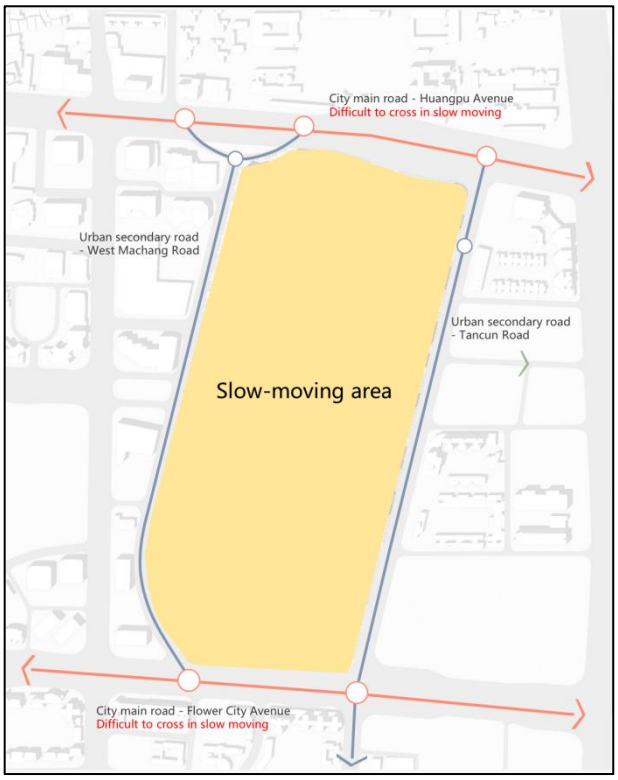

Figure 6-2 Establishment of slow traffic area Resources: Self-drawn by the author

width of the surrounding roads is not conducive to slow travel. In the context of urban regeneration, it is important to enhance the quality of the city and promote slow travel. The Racecourse plot is located in the central part of Guangzhou, an urban area with a very high demand for slow travel. However, in conjunction with the previous research, the Racecourse plot has almost no internal slow traffic system and is unable to form an effective interface with the slow traffic system around the plot. Therefore, it is appropriate to set up the Racecourse plot as an urban slow-moving area and adopt the slow-moving concept for urban design (Figure 6-2). The central city of Guangzhou has the most active slow-moving population, and introducing them into the interior of the Racecourse plot will not only effectively activate the urban vitality of the Racecourse plot, but also meet the spirit of urban renewal.

6.1.2 Developing positioning

In the context of Guangzhou's urban renewal, it is combined with the positioning of the facilities and urban functions around the Racecourse plot. The repositioning of the Racecourse plot should be considered in terms of both the quality of urban public space and urban functions. Firstly, the functions of the Racecourse plot should be able to interact more with Zhujiang New Town and Guangzhou International Financial City, thus injecting new vitality into the Racecourse plot. A better fit with the surrounding urban functions could effectively bring new people flow into this area of the city. A high quality urban slow traffic system and urban slow traffic spaces are therefore essential, both as a response to Guangzhou's central district status and as a necessary element to attract people to create more activity. Combining

these two points, the position of the Racecourse should be that of a new commercial centre and supporting service centre that promotes slow traffic, people-oriented, and integrates trade, shopping, sports, leisure and culture.

6.1.3 Developing goals

Combined with the previous discussion, a clearer design goal can be formulated after the design basis and design positioning of the Racecourse has been clarified. In this design goal, the starting point should be the slow-moving concept, which links the Racecourse plot with the external urban space through a slow-moving system, breaking the existing closed state. Then, based on the planning of a functional configuration that matches the value of the plot, the slow traffic system within the Racecourse plot will create an effective interaction between different functions, attracting more people to the Racecourse plot, thus revitalising the economic potential of the Racecourse plot and providing a better slow traffic environment and means of travel for the public.

6.1.4 Concept of design scheme

（1）Land planning

The previous research shows that the spatial form and urban fabric of the Racecourse plot has retained traces of the original racecourse track throughout its 30 years of development. It is evident that the past of the Racecourse in the context of urban renewal, urban design should not overturn the urban area's past, but should respect and retain the unique urban form and fabric. In conjunction with the urban design under the slow-moving concept, this scheme decided to preserve the original road network and space of the Racecourse plot, and to decompose the original blocks and adopt a "small block, dense road network" strategy for the land planning (Figure 6-3).

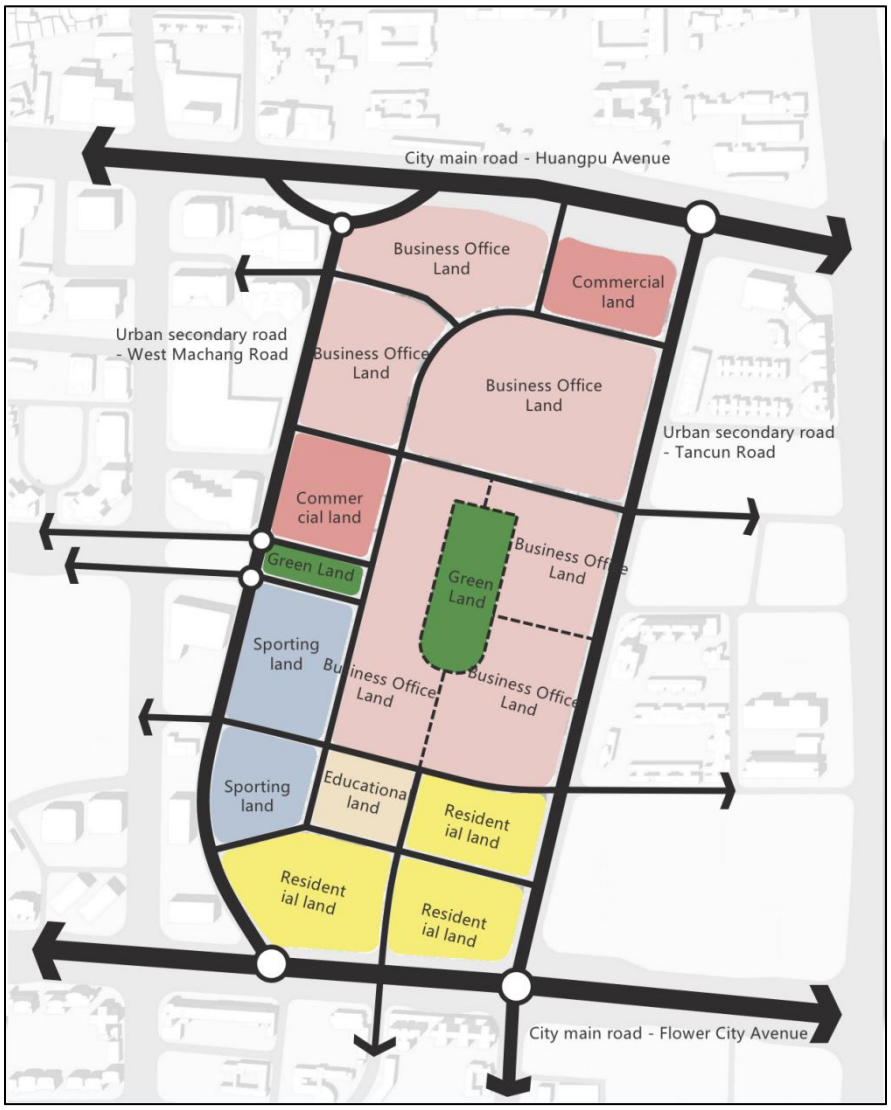

Figure 6-3 Land use plan for the Racecourse plot Resources: Self-drawn by the author

The Racecourse plot is bounded to the north and south by urban arterial roads, which are not conducive to a slow-moving approach to traversing the site. This is in line with the design strategy of planning the interior of the Racecourse plot as an urban slow traffic area. The use of superblocks and wide roads within the site would not be conducive to slow traffic within the Racecourse plot. By adopting a 'small block, dense road network' land planning strategy, the walking distance between different blocks can be effectively controlled to within 500m (Figure 6-4), making people more willing to slow move. It is also more in line with the urban design concept of slow traffic.

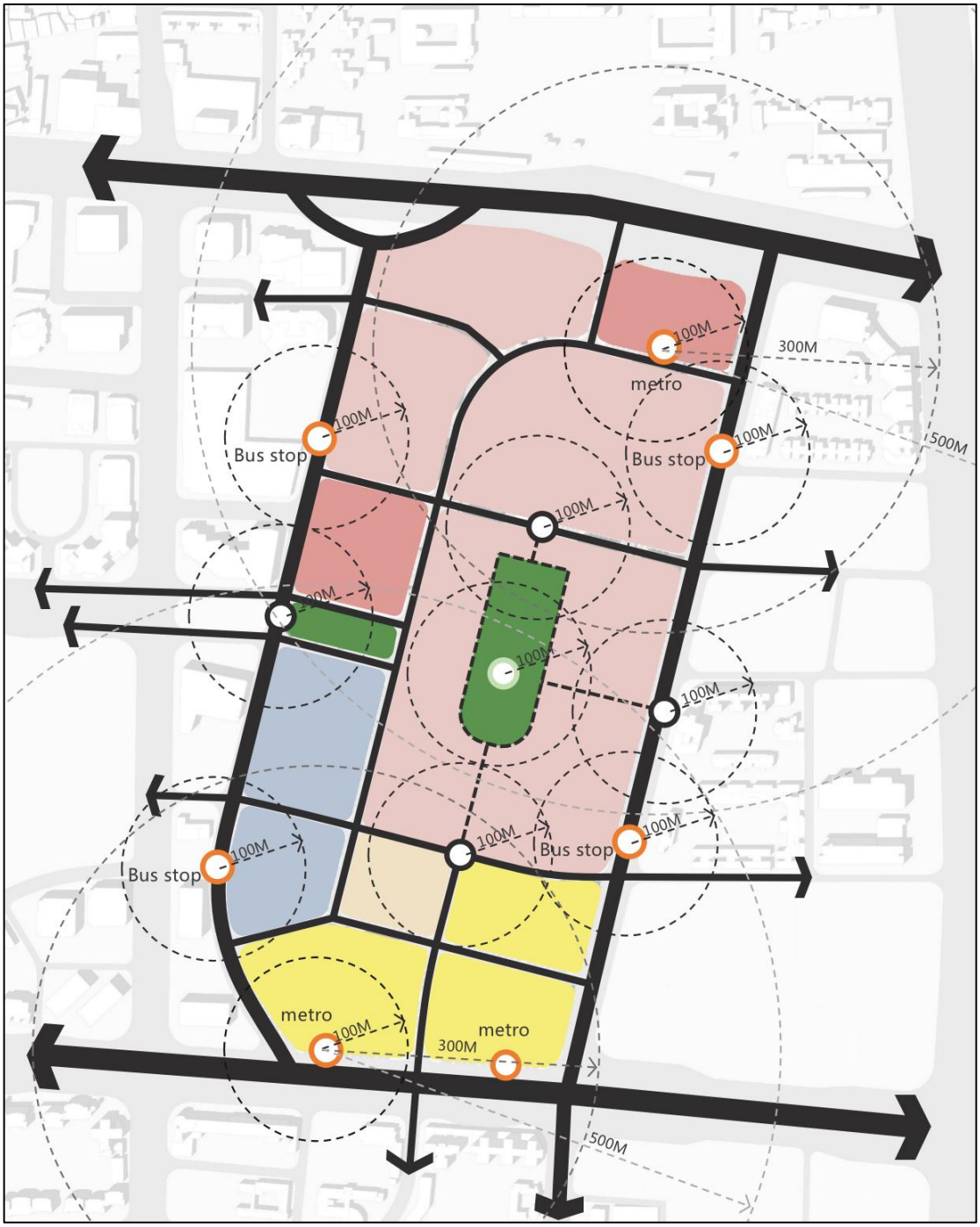

Figure 6-4 Small blocks with dense road network pedestrian friendly Resources: Self-drawn by the author

In terms of land use, different slow traffic cores are planned according to the land use around the site and the surrounding traffic conditions. First of all, there are metros public transport passing through the north and south of the Racecourse plot in the future, which can form a slow-moving axis north and south. The metro stations north and south of the axis are set up for commercial use, forming a slow traffic public transport core. By preserving and

transforming the existing green spaces within the Racecourse plot, a slow-moving leisure core is formed on this slow-moving axis. The southern part is set up as a residential area in conjunction with the surrounding site attributes to become a slow traffic vibrant core, acting as an initiation point for people to live a slow traffic life. The north-western part is planned as a business site in conjunction with the business attributes around the site, becoming a slow-moving dynamic core to provide urban economic impetus and vitality to the Racecourse plot. The historic remains of the Racecourse plot, such as the racecourse grandstand, will be preserved, and land for sports and education will be provided to enrich the slow traffic function and slow traffic life experience within the plot (Figure 6-5).

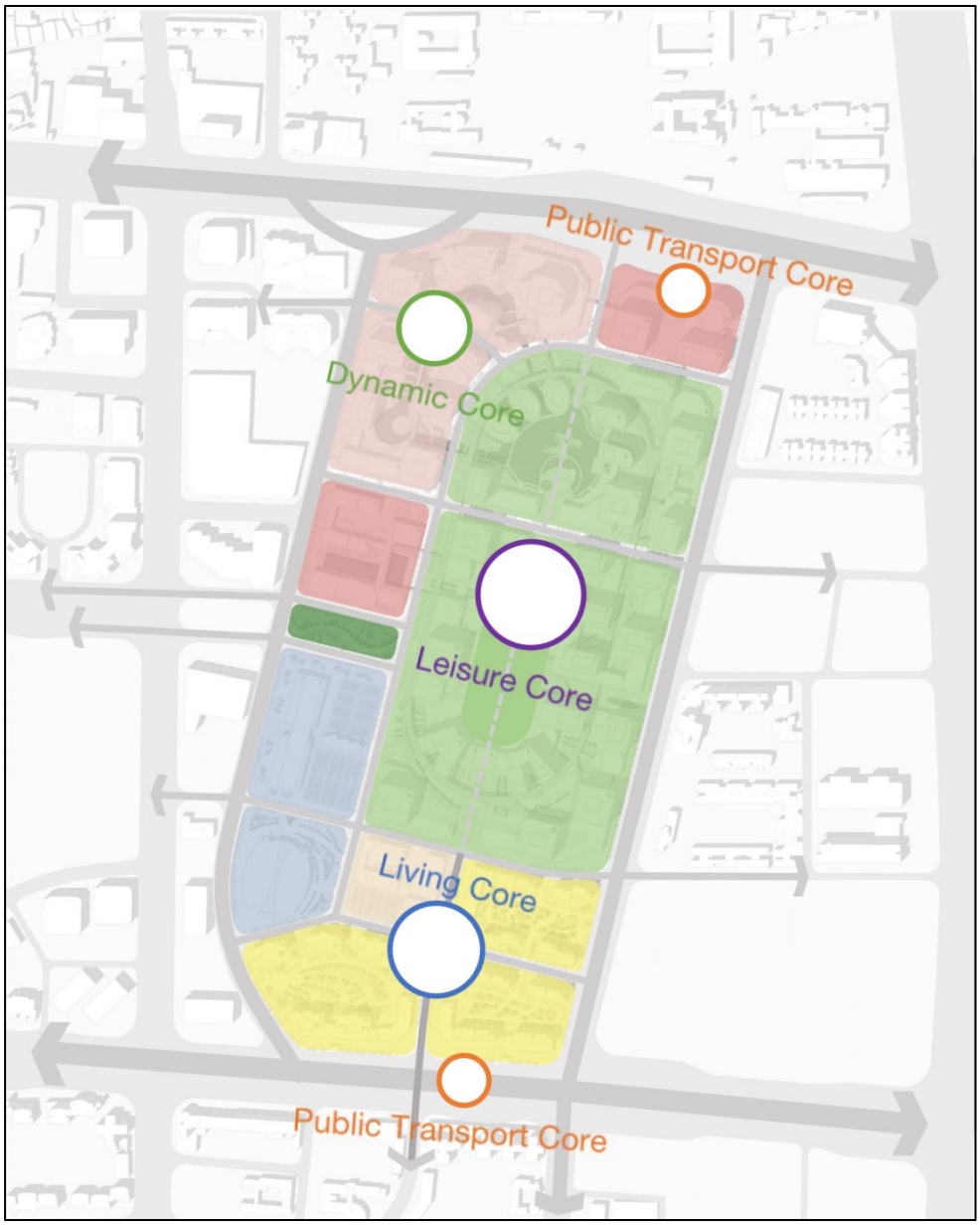

Figure 6-5 Design of the slow traffic cores Resources: Self-drawn by the author

6.1.5 Design generation

（1）Closed urban

The Racecourse plot contrasts with its surroundings and corresponds to a part of Guangzhou that is undergoing profound change. The project site has low buildings, huge plots and closed functions. Even the only urban green space is the enclosed golf course, which is overall poorly open and functionally inefficient. The interior of the Racecourse plot does not form an effective link with the urban periphery（Figure 6-6）.

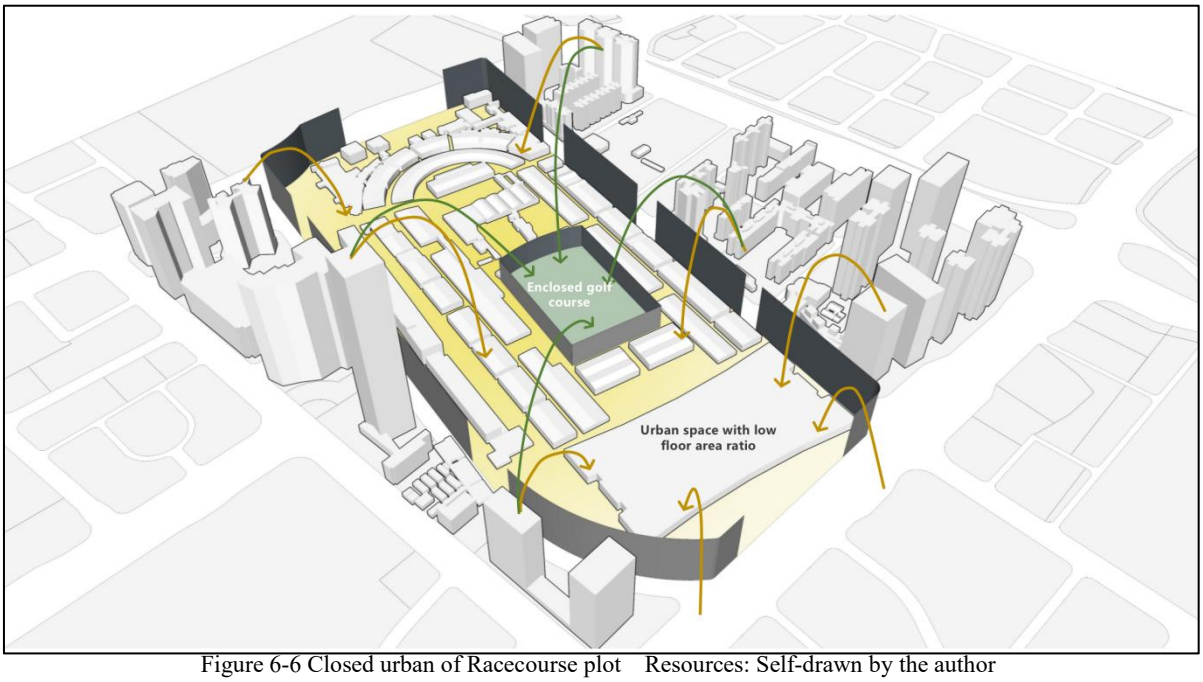

Figure 6-6 Closed urban of Racecourse plot　Resources: Self-drawn by the author

Contrary to the current situation, the design aims to take the concept of slow traffic as a starting point, to strengthen the connection between the Racecourse plot and the surrounding area, and to attract people to this site and share the wonderful resources of the city through an effective and well-developed slow traffic system and a quality slow traffic environment.

（2）Increasing the intensity of development

Increasing the intensity of site development, in harmony with the development of the times and the surrounding environment, covers a variety of functional scenarios such as commercial, business, entertainment, recreation and residential. The proximity of different kinds of projects to each other at this high development intensity can create a vibrant community. As a site in the heart of Guangzhou, it is also imperative to increase the intensity of

development.But if design is considered only in terms of volume, it will lead to the isolation and separation of residents' daily activities. Conversely, this high volume of development can be integrated into communities where people (and even other creatures) can gather, share and create（Figure 6-7）.

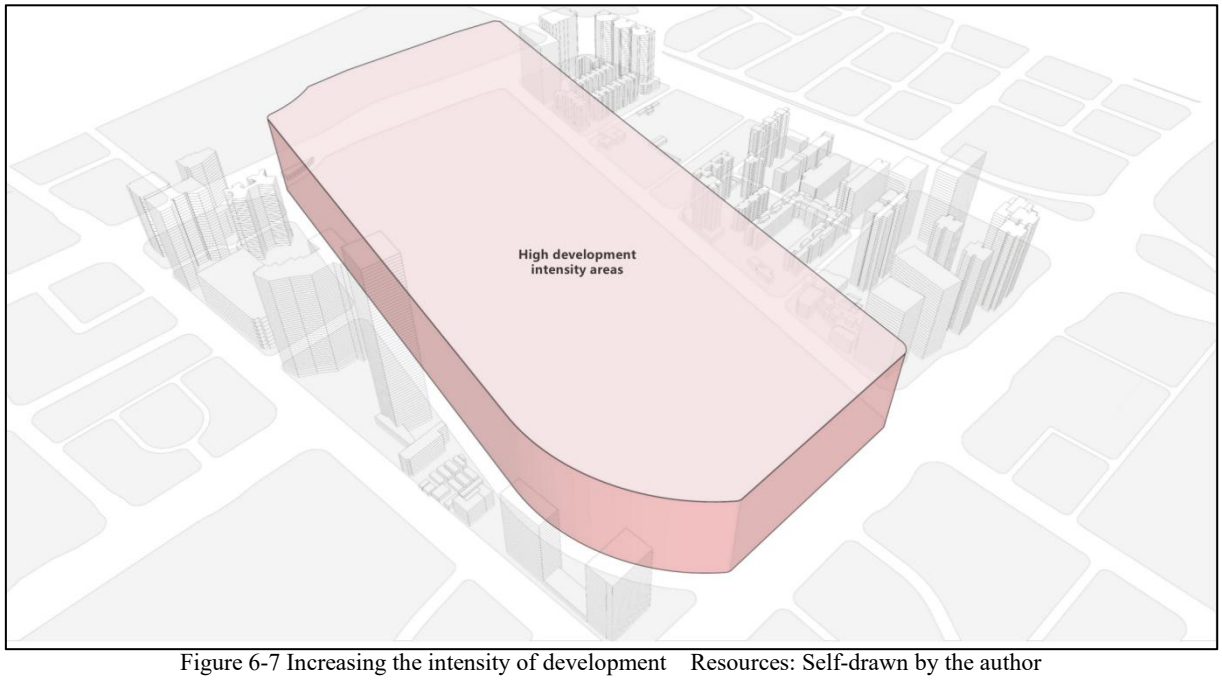

Figure 6-7 Increasing the intensity of development　Resources: Self-drawn by the author

（3）Breaking the Closure

According to the current status of the site and future plans for the surrounding area, there will be metro stations on the north and south sides of the Racecourse plot. This can be used as a starting point to break the closure of the Racecourse plot and to connect the site with the slow-moving system through public transport, thus creating a link between the Racecourse plot and the outside world. Of course, a single transport link is not enough to create an effective link to the outside of the site, there needs to be space to attract people to the site. The enclosed golf course, which lies on the axis formed by the north-south public transport, can be transformed into a new slow space and a new centre（Figure 6-8）.

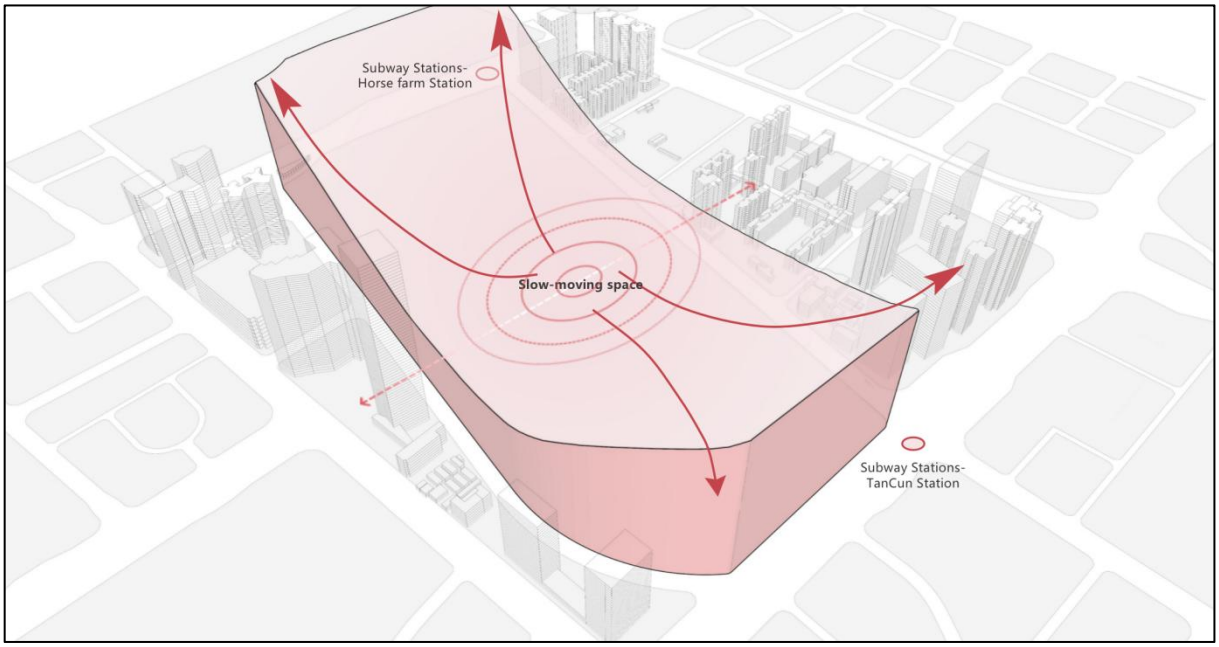

Figure 6-8 Breaking the Closure　Resources: Self-drawn by the author

（4）Enrichment of slow traffic axis

After the slow traffic axis have been defined, the axial system is enriched to create a richer slow traffic space and provide a rich slow traffic spatial experience for slow movers. It is also combined with other existing public transport systems around the site to create a rich sub axis of slow traffic, ultimately forming a slow traffic network covering the site（Figure6-9）.

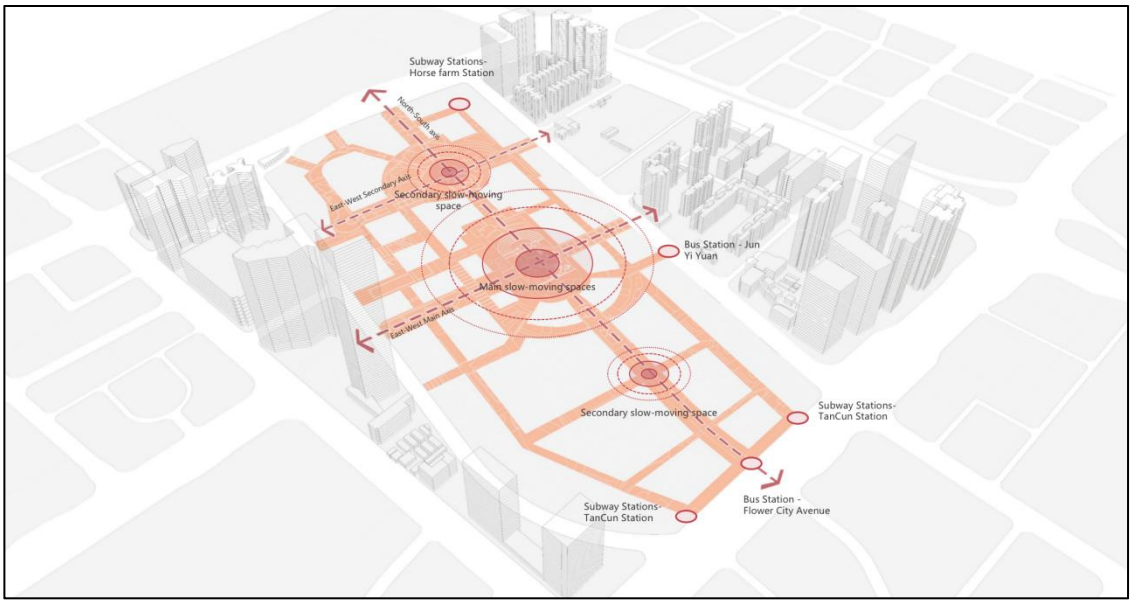

Figure 6-9 Enrichment of slow traffic axis　Resources: Self-drawn by the author

（5）Memory Retention

As a unique site memory of the Racecourse plot, horse racing has always influenced the urban fabric and space of the Racecourse plot. The design will preserve the memory of horse racing and the urban fabric through an urban skywalk of a similar shape to the original circular race track, which will create a high quality three-dimensional pedestrian system by looping the urban skywalk around the core slow traffic space and making slow traffic connections with other blocks.

By retaining the racecourse grandstand within the base as the site memory of the area and regenerating it, the lower level commercial space is added while still retaining the function of the grandstand. This will preserve the memory of the site while providing the public with a richer slow-moving lifestyle（Figure 6-10）.

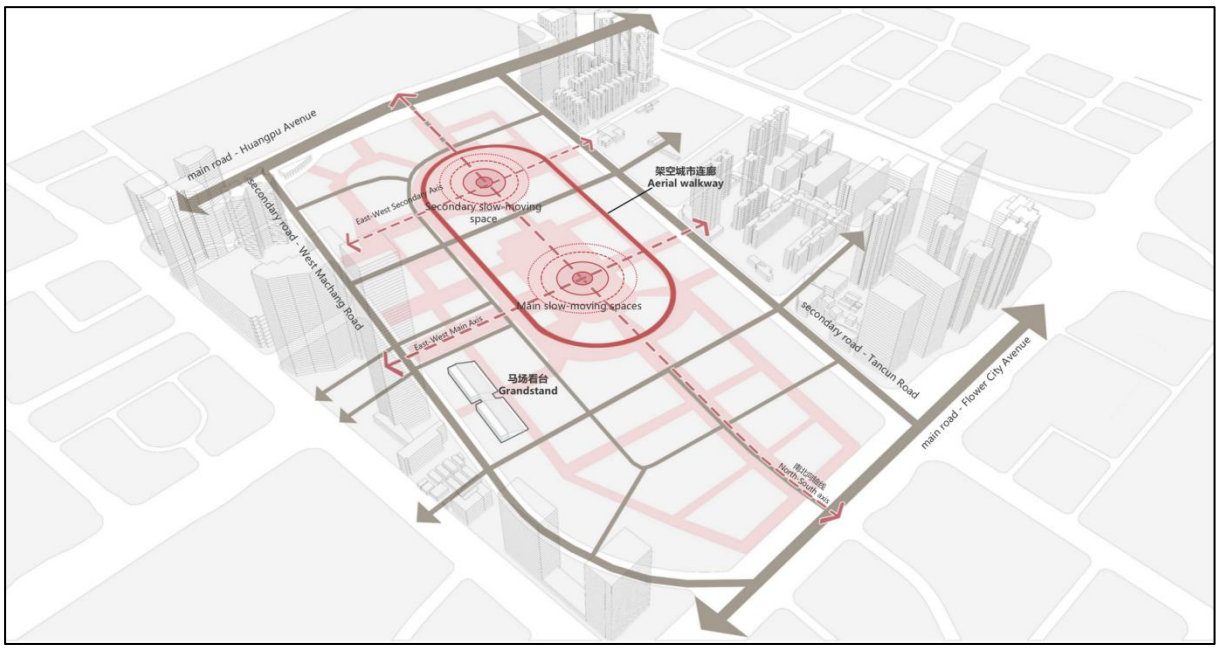

Figure 6-10 Site Memory Preservation　Resources: Self-drawn by the author

（6）Building a slow-moving cores

With metro stations on the north and south sides of the site, it can be built as public transport cores, a kind of important slow traffic core for the rest of the city to connect to the slow traffic system of the Racecourse plot, and form an important slow traffic axis with the leisure core and living core. The urban public space surrounded by the loop of aerial walkways can be constructed as a leisure core, providing a variety of leisure functions such as recreation,

entertainment, strolling, culture and consumption for the public. The southern part of the site, which is planned for residential use, is the living core and is the starting point for people's slow traffic life. The north-western part of the site is planned as a business centre, which is the dynamic core of the slow-moving city and provides strong economic dynamics for the development of the site（Figure 6-11）.

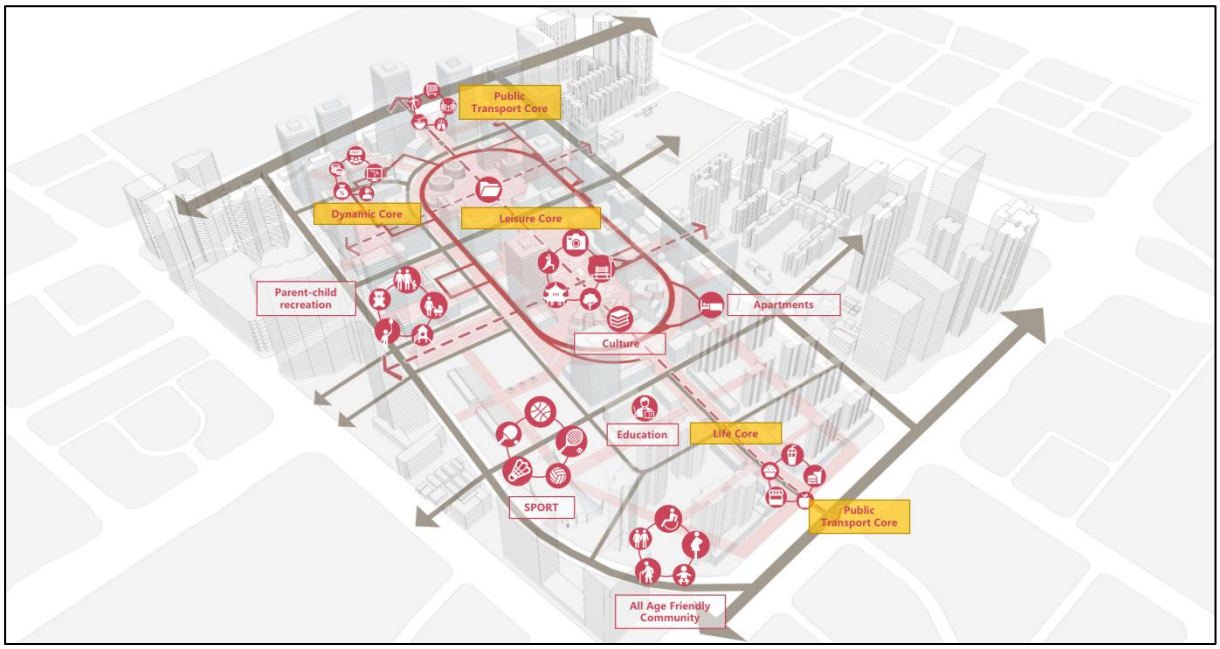

Figure 6-11 Building slow-moving cores　Resources: Self-drawn by the author

（7）Insert landscape and space optimisation

A good slow traffic experience cannot be achieved without an excellent slow traffic environment and space. The inclusion of site landscapes tailored to the different functions of the site is an important part of enhancing the slow traffic population. Each plot of land within the base is designed to create a unique blue and green space in combination with public space. The blue colour is dynamic and the green colour is vibrant, further refining and optimising the slow-moving space.In particular, a larger social intersection and urban sports centre is formed around the recreational core and the racecourse grandstand, which is also a place where nature plays an indispensable cohesive role（Figure 6-12）.

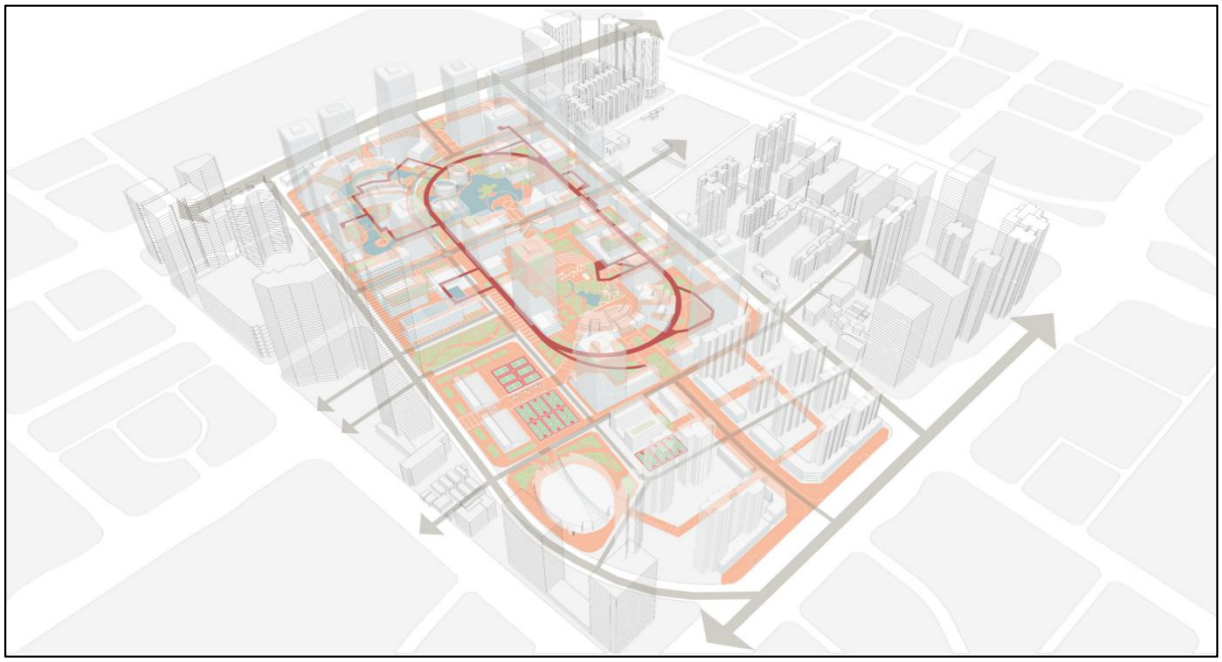

Figure 6-12 Insert landscape and space optimisation Resources: Self-drawn by the author

（8）Scheme generation

After the conceptualisation steps described in the previous section, a system of buildings for each plot that is appropriate to the function and intensity of the development is placed to form the urban form and generate the urban design scheme（Figure 6-13）.

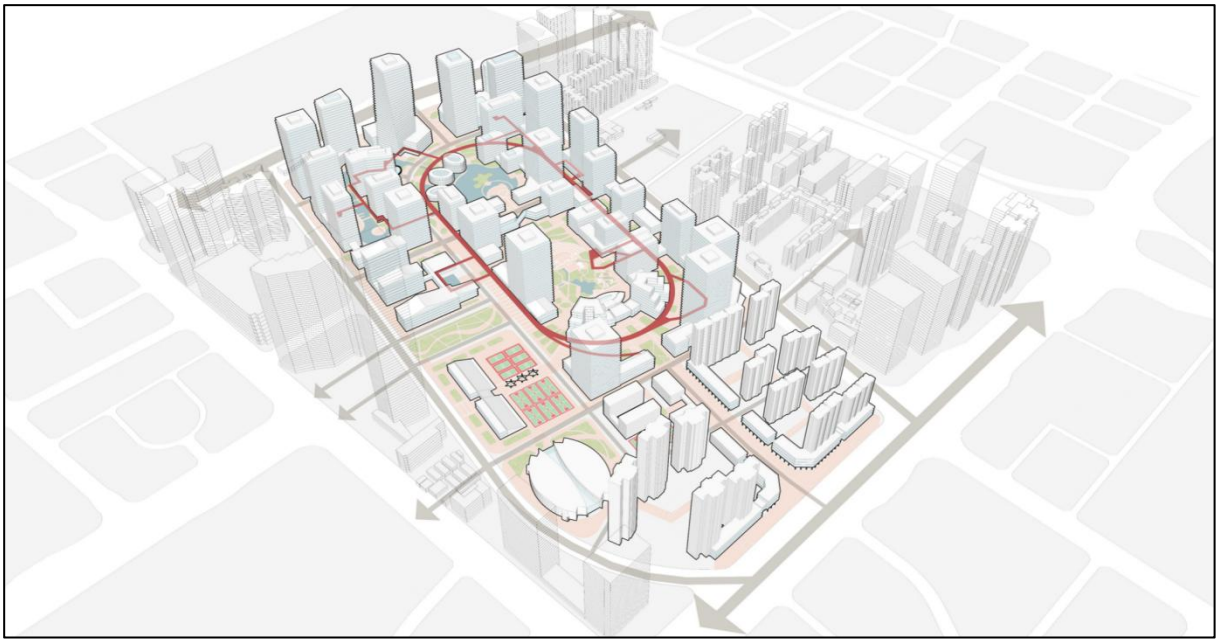

Figure 6-13 Scheme generation Resources: Self-drawn by the author

（9）Urban design master plan of Racecourse plot

Figure 6-14 Urban design master plan of Racecourse plot　Resources: Self-drawn by the author

（10）Perspective of Racecourse plot urban design

Figure 6-15 Perspective of Racecourse plot urban design　Resources: Self-drawn by the author

6.2 Slow traffic system design

6.2.1 Pedestrian system design

Walking is one of the basic forms of human activity, it seems that the entire human body was designed for walking, and walking is recognised as the best exercise in the world. Walking is recognised as the best exercise in the world. In urban design under the concept of slow walking, the pedestrian system is naturally one of the most important design priorities. For the urban design of the Guangzhou Racecourse plot, this design focuses on two walking systems, a ground level walking system and a circular elevated walkway walking system. The two walking systems link the different slow traffic cores to form a three-dimensional walking system, optimising the experience of slow traffic life.

（1）Ground level pedestrian system

In the logical framework of the first section of this chapter, in the context of urban regeneration and with an eye to the concept of slow movement, the land planning scheme adopts a partial retention of the original road network of the site, followed by a 'small blocks,

dense road network' approach to the re-planning of the land, with the aim of avoiding the creation of super blocks and wide roads. "The 'small blocks, dense road network' land planning strategy allows the different blocks of the site to be directly connected, allowing walking distances to be kept to 500m, a distance most suitable for people to walk. The right walking distances help to promote walking as a priority. By returning roads and cities to people, cars are no longer a primary design consideration. On this basis the pedestrian system is linked to the cores of the pedestrian network, forming a rich and varied pedestrian life that can cover work, commerce, leisure, living, learning and recreation （Figure 6-16）. The pedestrian system is connected to the public transport cores and at the same time links the various slow traffic cores and different functional areas within the site, realising the concept of "walking + public transport".

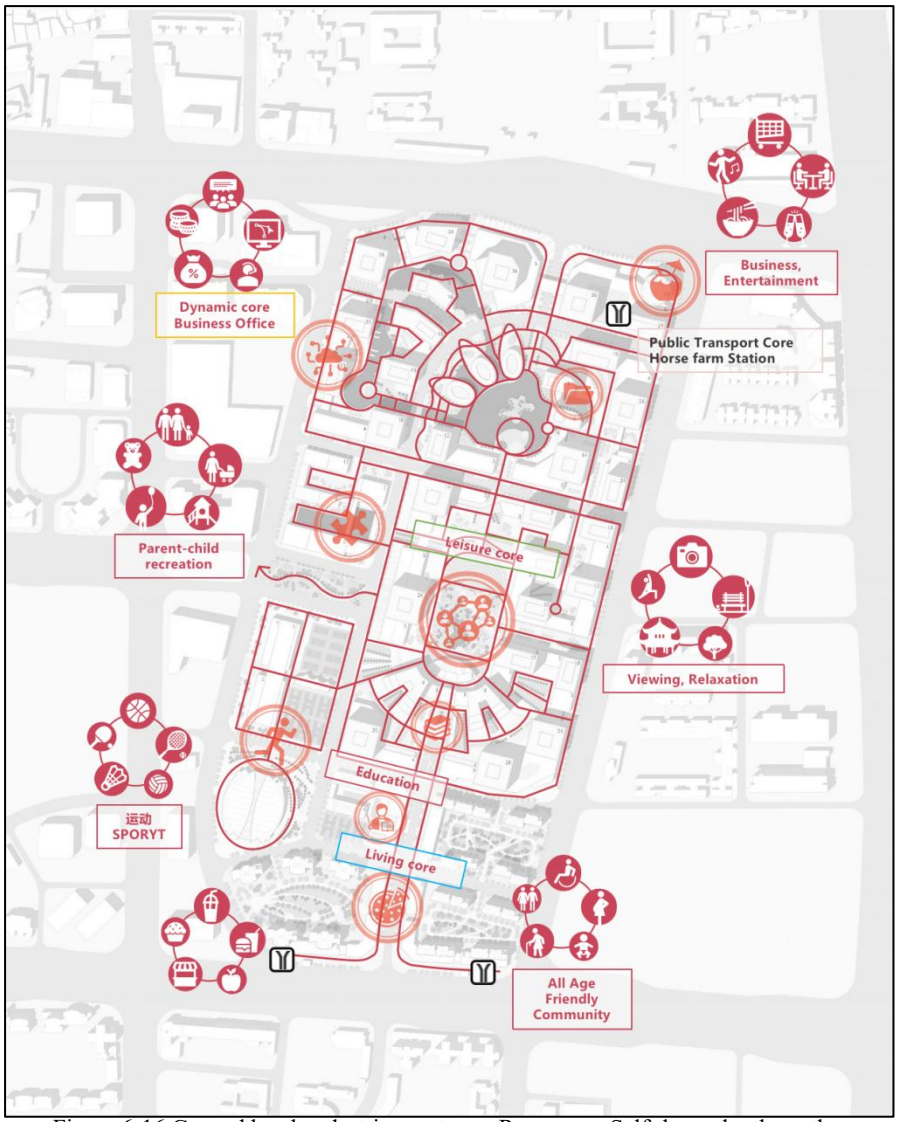

Figure 6-16 Ground level pedestrian system　Resources: Self-drawn by the author

（2）Loop Aerial Pedestrian System

As the Racecourse plot is an urban centre site in Guangzhou, the development of a multi-dimensional pedestrian system that promotes the priority of slow walking must be considered. Aerial pedestrian systems are an important part of creating a multi-dimensional pedestrian system, and an important way to realise the separation of fast and slow traffic, and the separation of pedestrians and vehicles. Horse racing as a historical memory of the Racecourse plot still influences the site today. This design proposal reintroduces the racecourse track to the Racecourse plot in the form of a loop elevated walkway. On the one hand, it is a response to the historical memory of the site, and on the other hand, the loop elevated walkway first forms a spatial form around the recreational core, offering the best slow traffic space to the slow movers. A distinctive urban slow-moving landscape is created along the site's most important slow-moving axis running north to south. The circular elevated walkway then acts as the core, connecting the different slow traffic cores through the sky, creating aerial slow traffic links between the different plots within the site. At the same time, the connection to the public transport core creates a three-dimensional travel system and promotes a more "walking + public transport" approach to travel.

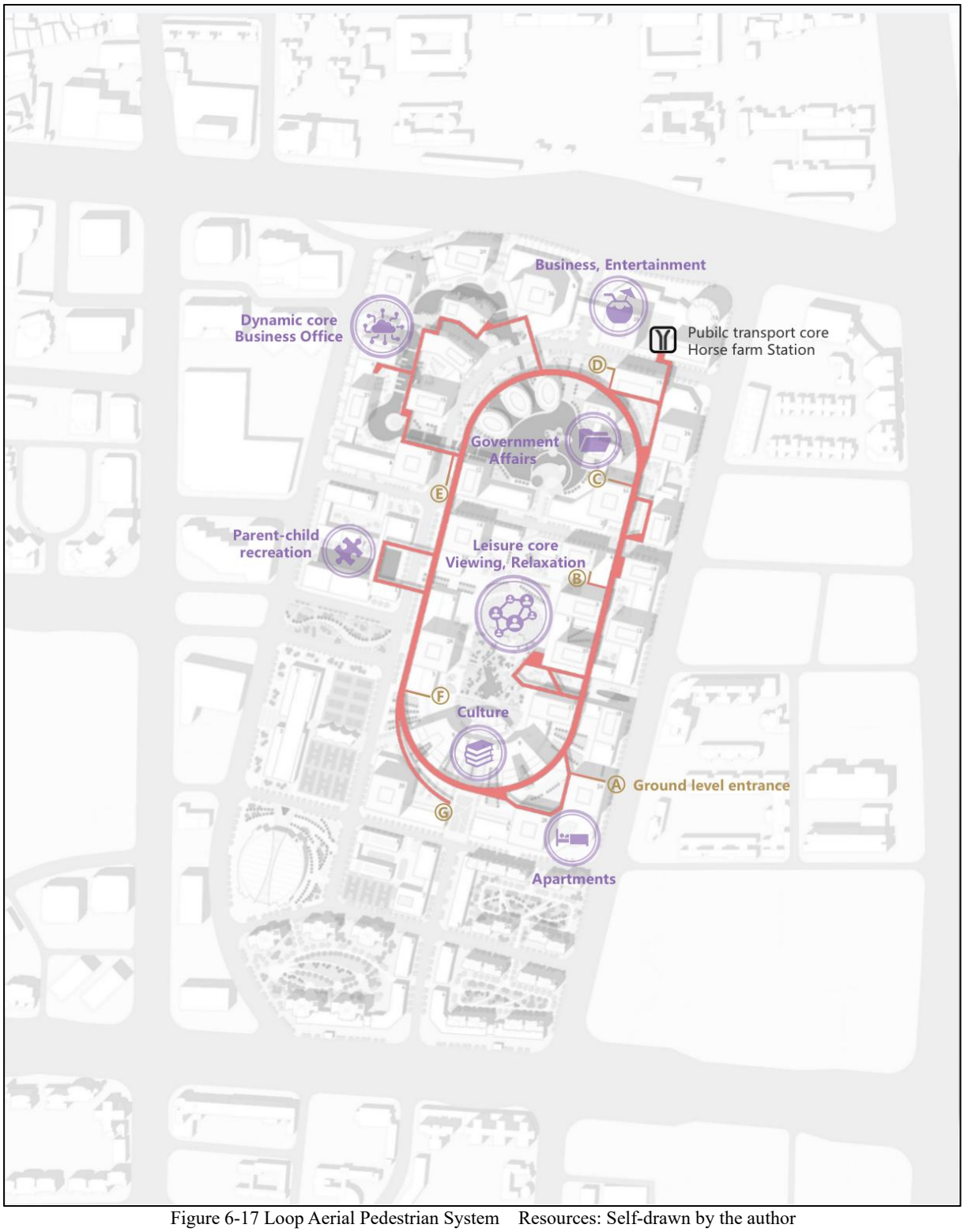

Figure 6-17 Loop Aerial Pedestrian System Resources: Self-drawn by the author

(4) Three-dimensional walking system

The design scheme forms a three-dimensional pedestrian system through the arrangement of the above-mentioned ground and aerial pedestrian systems, which are not isolated, but are

interpenetrated and interconnected （ Figure 6-18 ） . At the same time, the whole three-dimensional pedestrian system is also permeated into the interior of the buildings on the site, truly achieving an intrinsic pedestrian connection, advocating that people walk first and realising the urban design of the concept of slow traffic（Figure 6-19）.

Figure 6-18 Three-dimensional walking system Resources: Self-drawn by the author

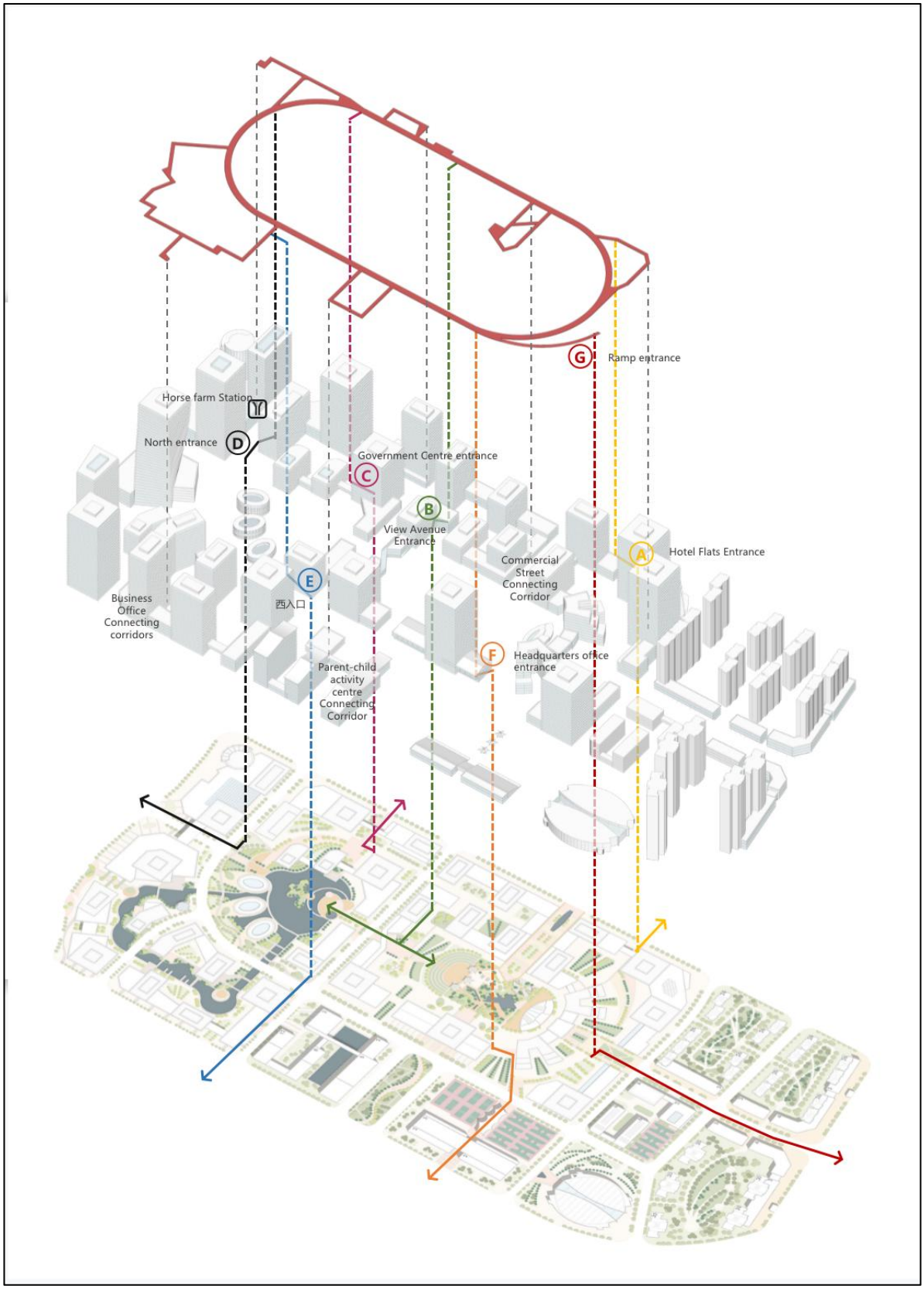

Figure 6-19 Three-dimensional walking system Resources: Self-drawn by the author

6.2.2 Design of a slow traffic bicycle system

（1）Integrated bus + bicycle design

As a rapidly developing mode of transport in China's cities today, bicycle sharing is also an important mode of transport for slow traffic. The design of the bicycle transport system should advocate the integration of public transport + bicycle design. The concept of true public transport + slow traffic should be realised. The first is the layout design of the bicycle parking spaces. In the process of investigating the bicycle traffic and public transport system in and around the Racecourse plot, it was found that some of the bicycle parking spots are too pressed away from the bus stops, which is not conducive to the formation of an integrated public transport design. Therefore, this design follows the following principles in the design of bicycle parking spaces: 1. Set up shared bicycle parking points at the main entrances and exits of urban rail transit stations, and their distance from the entrances and exits should be controlled at about 100 meters; 2. Set up bicycle rental points at 30-40 meters near bus stops with many lines and high pedestrian flow, combined with pavements, but care should be taken to leave enough space for pedestrian traffic, about 2-3 meters.

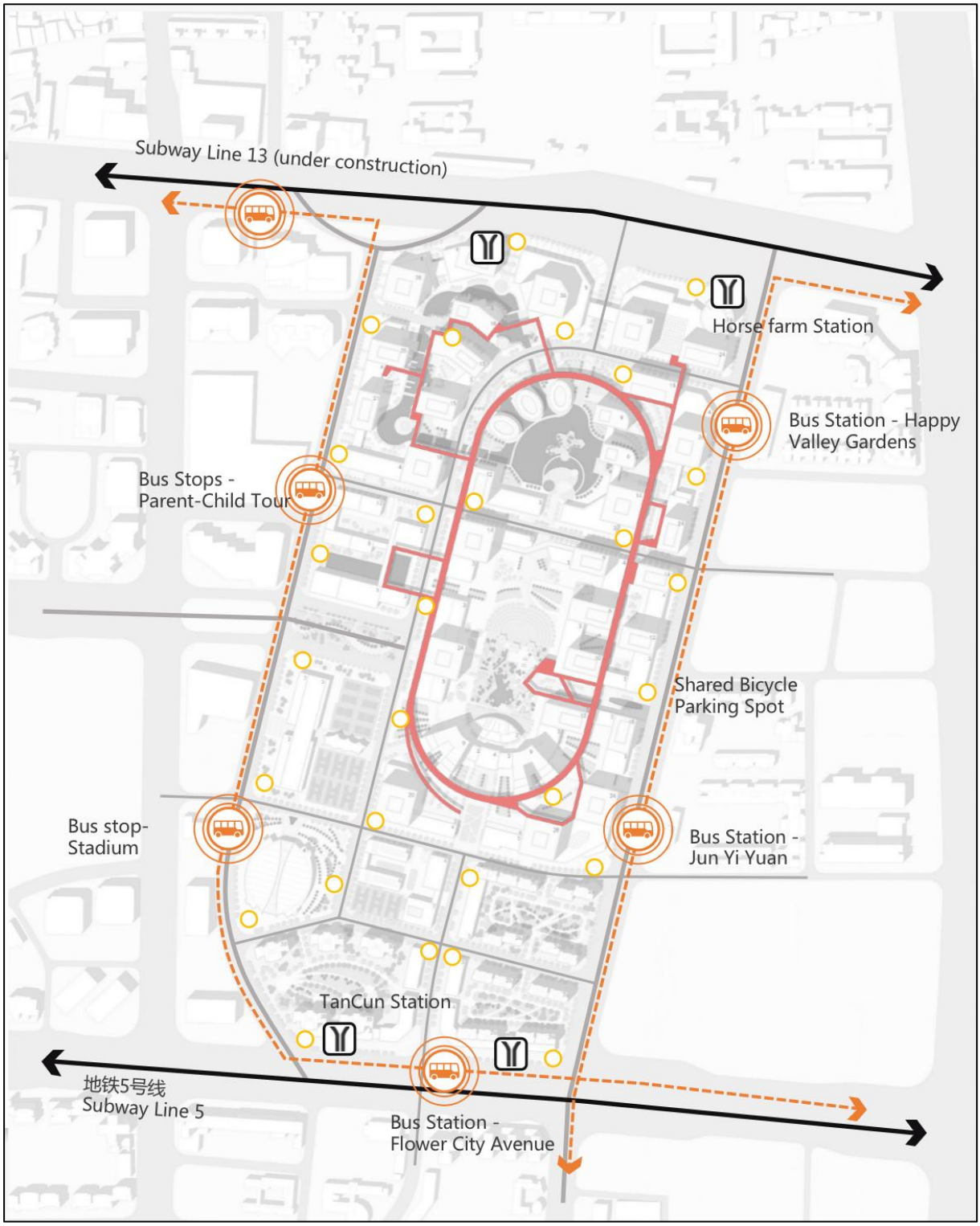

Figure 6-20 Integrated bus + bicycle design Resources: Self-drawn by the author

At the same time, the layout of bicycle parking spaces within the site covers every important slow-moving node, taking into account the slow traffic connections within and outside the site. The linkage between public transport and slow traffic within the site and outside the site is

realised, promoting people to eventually adopt a public transport + slow traffic mode of travel.

(2) Design of the cycling environment

The spatial combination of urban roads is first and foremost a rational planning and differentiation of traffic functions, which is reflected in the road cross-sections. The original road width of the Racecourse plot is narrow and there are no pedestrian paths and no slow-moving environments such as lanes. In European countries, by imposing speed limits on cars, the two-way lane can be adjusted to 5m[84]。 Based on the spatial mix of bicycles with pedestrians and motor vehicles, the streets are divided into fully segregated forms, pedestrian and non-pedestrian co-panel forms, motor and non-motor co-panel forms, mixed pedestrian and non-pedestrian forms and mixed motor and non-motor forms. In this design scheme, there are two main classes of roads within the site: primary and secondary roads. Due to the partial preservation of the original road texture of the Racecourse plot and the road planning principle of "small blocks and dense road network", the design of the roads within the site is not too wide under the concept of promoting slow traffic, and the main roads are 10m wide two-way lanes（Figure6-21）. The secondary roads are 8m wide one-way lanes. The spatial combination of bicycles, pedestrians and motor vehicles is: pedestrian and non-pedestrian

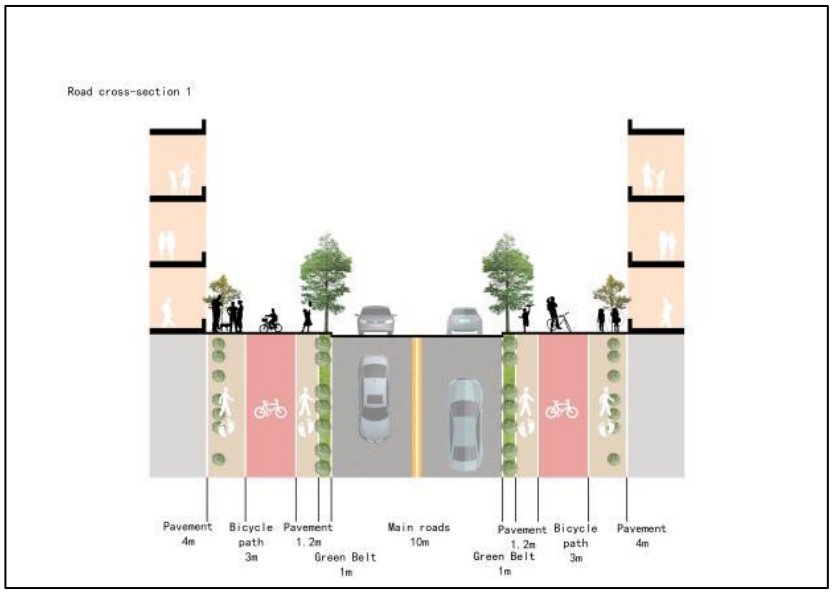

Figure 6-21 Main Street Road Design 1　Resources: Self-drawn by the author

[84] Zhuo Jian, Wu Zhuo Ye, Xu Yijing. Right-of-way sharing-oriented planning and design strategies for open neighborhoods[J]. Planner,2017,33(07):19-25.

co-panel（Figure 6-22）.

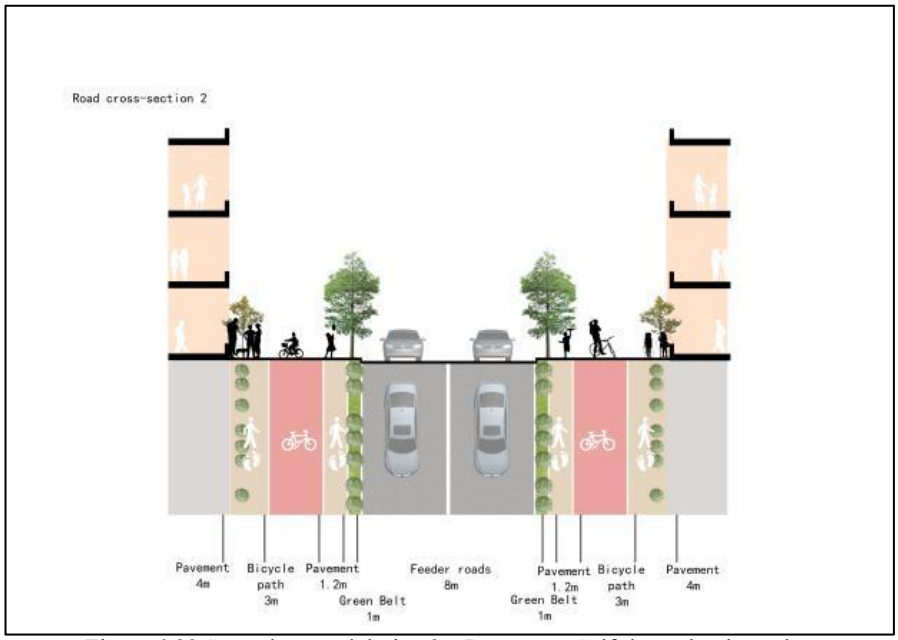

Figure 6-22 Secondary road design 2 Resources: Self-drawn by the author

In terms of specific design, the pedestrian cycle paths are fully segregated from the motorway by means of green belt flower beds. This way the road does not create a feeling of oppressive separation for slow walkers and is more friendly to them（Figure6-23 6-24）.

Figure 6-23 Design of the slow-moving friendly environment 1

Resources: Self-drawn by the author

Figure 6-24 Design of the slow-moving friendly environment 2

Resources: Self-drawn by the author

6.3 slow traffic core and spatial design

6.3.1 Leisure core design

The leisure core is the concentration of major natural and humanistic landscapes within the urban area, and is an important place for slow walkers to get close to nature and take a leisurely rest. The construction of parks, green areas, squares and other open spaces should be

designed to meet the historical and cultural characteristics of the city and the characteristics of human needs, providing ideal spaces for people to interact outdoors and meeting their psychological and spiritual needs（Figure 6-25）.

Figure 6-25 Leisure core design　Resources: Self-drawn by the author

The design takes into account the historical memory and current conditions of the racecourse along the north-south slow-moving axis to create open spaces such as civic parks, plazas and waterfront spaces. A circular elevated walkway links the north-south transport hub and provides open space for slow walking, leisure and recreational activities for the people of the city both inside and outside the site（Figure 6-26）.

Figure 6-26 Leisure core environmental design　Resources: Self-drawn by the author

6.3.2 Dynamic core design

The dynamic core, as a source of development within the urban area, brings together various business functions and should be fully implemented with a policy of "slow traffic first", organically organising the slow traffic network within the core to make it a comfortable and pleasant slow traffic system; in addition, spatial and temporal dynamic control measures can be adopted at the necessary time and in the necessary places to establish dedicated pedestrian areas（Figure 6-27）.

Figure 6-27 Dynamic core design　Resources: Self-drawn by the author

The design first builds slow connections to the various areas within the vibrant core through aerial pedestrian systems. The aerial pedestrian system is then linked to a circular aerial walkway on the axis of slow movement, thus creating a three-dimensional slow movement link to the transport hub and spatial landscape. The ground level slow walking system has pedestrian and cycling connections to public transport, providing a convenient slow travel mode throughout the dynamic core. The spatial integration of the slow traffic system creates a rich landscape environment, providing a high quality of slow traffic and a rich slow traffic experience.

6.3.3 Living Core Design

Living core, where residential buildings of high development intensity are clustered, are an important source of slow traffic generation in urban areas. For such areas, it is also advisable

to implement a mixed land use strategy, combining commercial, leisure and office functions, so that residents' needs for various public services can be met within the reach of slow traffic, with dedicated pedestrian paths and connections to urban open spaces, making it easy for residents to access nature（Figure 6-28）.

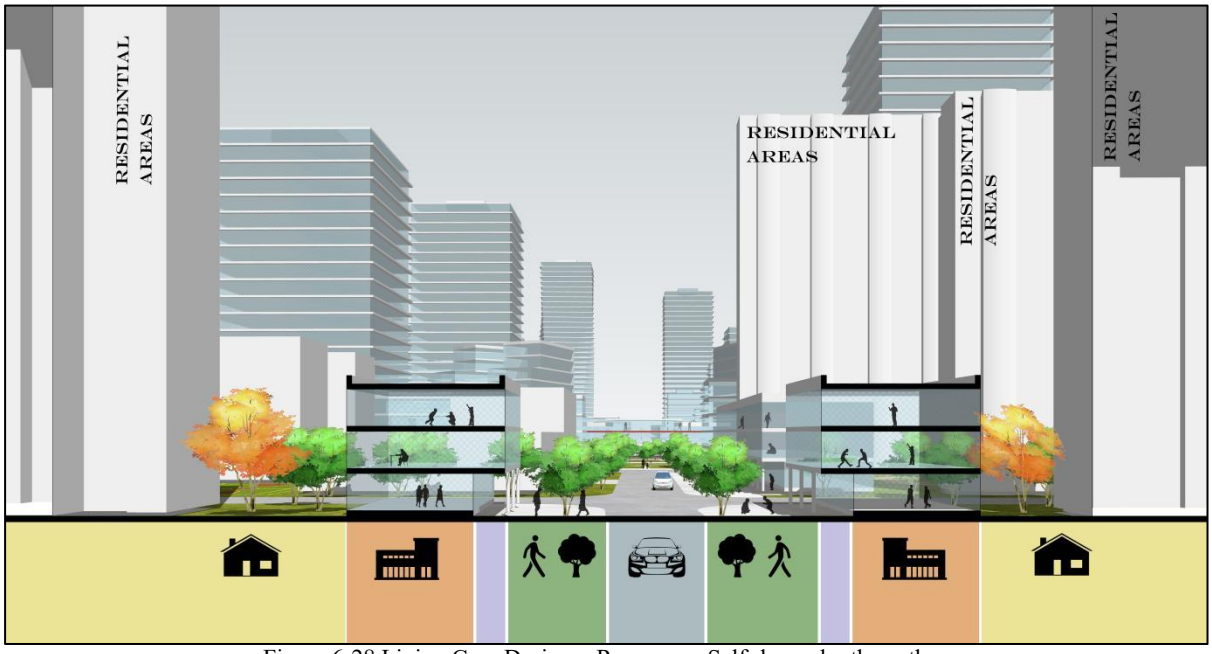

Figure 6-28 Living Core Design　Resources: Self-drawn by the author

The design begins with the use of Guangzhou's local culture of the cavalcade space to form a ground level slow walking system to connect with the metro and bus transport hubs on the southern side of the site. The cycling space continues northwards to the public open space of the city, including the slow-moving leisure core. The living core relies on the slow traffic system and is surrounded by commercial, school, sports and other supporting functions, with the distance controlled at around 500m, allowing urban dwellers to conveniently access different supporting services in the neighbourhood through the slow traffic system（Figure6-29）.

Figure 6-29 Living Core Design 2　Resources: Self-drawn by the author

6.3.4 Public transport core design

The public transport core provides the necessary place facilities for the connection between the slow-moving system and high-capacity public transport. Strategies that can be adopted at the site level include: mixed-function development of the land around the stations, with integrated commercial, commercial, residential and other functions; and optimisation of the efficiency of the interchange function through three-dimensional spatial development（Figure 6-30）.

Figure 6-30 Public transport core design　Resources: Self-drawn by the author

The design scheme uses a core slow-moving air corridor linked to the metro transport hub lobby to provide a convenient slow traffic interchange between the inner and outer parts of the site for the slow-moving population. Commercial, residential, entertainment and leisure functions are provided in the public transport core to meet the different needs of the high volume of slow-moving people.

6.4 Slow traffic environment design

6.4.1 Slow traffic node design

(1) Integrated bus-bike design - interchange station design

The scheme design advocates the concept of giving priority to slow traffic, so a master plan design of a small block and dense road network is adopted in order to facilitate people to walk slowly and at the same time reduce the negative impact of cars on urban slow traffic. The Racecourse plot is located in the heart of Guangzhou city and the roads outside the Racecourse plot are generally of a higher grade and wider, while the newly designed roads within the Racecourse plot are pedestrian priority and smaller in width. Therefore for the interchange site connection system two site design options are proposed in this design.

① Design of bus stop interchange system on city roads around the Racecourse plot

For the roads around the Racecourse plot, a deep harbour station design is used because of the high road traffic intensity, the particularly ample slow-moving space and the adequate spacing between the station and the upstream and downstream intersections. And station design elements should include platforms, bicycle parking areas, proximity to cycle paths and walking paths to provide a convenient transfer experience for slow-moving people and to form a public traffic + slow-moving travel habit(Figure 6-31). This type of station connection design is currently used around the Racecourse plot, such as Flower City Avenue.

Figure 6-31 Design of bus stop interchange system on city roads around the Racecourse plot

Resources: Self-drawn by the author

② Design of a bus stop interchange system for urban roads within the Racecourse plot

For the internal road of the racecourse, due to the narrow design width of the road itself, when the pavement is below 7m, an inwardly convex station design is not possible[85]. At the same time, in order to provide a good transport interchange experience for slow walkers, this scheme provides an outwardly convex station design as a reference. This design approach is suitable for conditions when the demand for public transport travel is high and existing slow-moving space cannot be compressed as a waiting space(Figure 6-32).

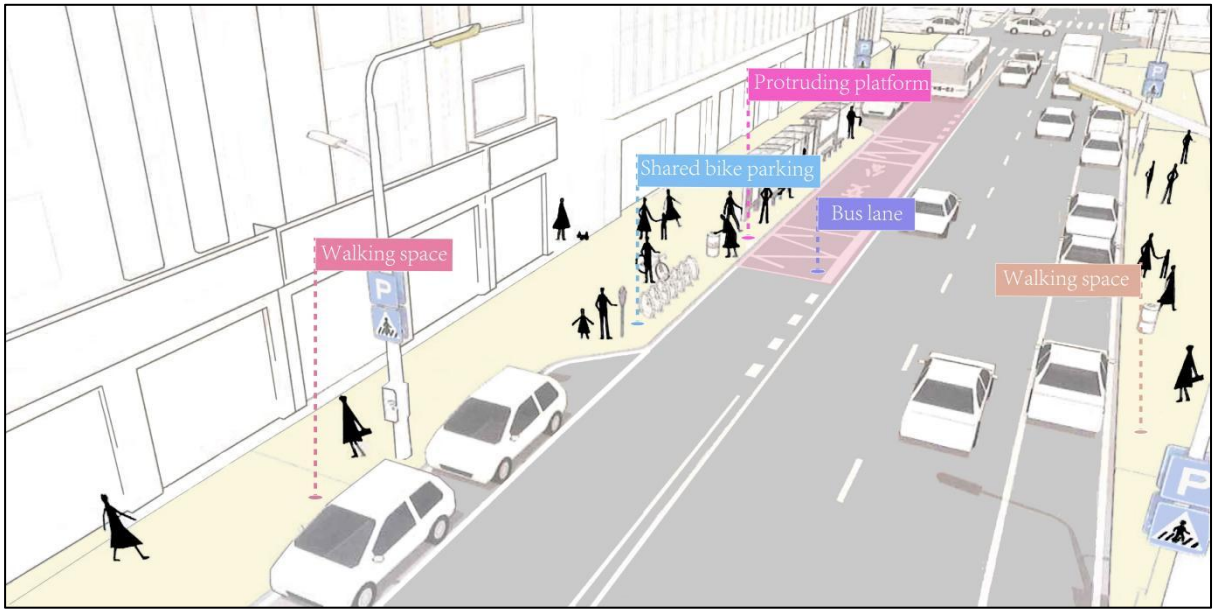

Figure 6-32 Design of a bus stop interchange system for urban roads within the Racecourse plot

Resources: Self-drawn by the author

[85] Guangzhou city road standard cross-sectional design guidelines.

The two specific interchange station design proposals mentioned above will help to realise the urban design of the slow-moving concept of the Racecourse plot.

（3）Pedestrian crossing design

① Crossroads design

Promote a slow-moving priority design, with intersections designed to reduce turning radii and limit speeds to enhance crossing safety. Intersections with on-street parking can be combined with parking spaces to create additional footpaths at pedestrian crossings to further reduce pedestrian crossing distances(Figure 6-33).

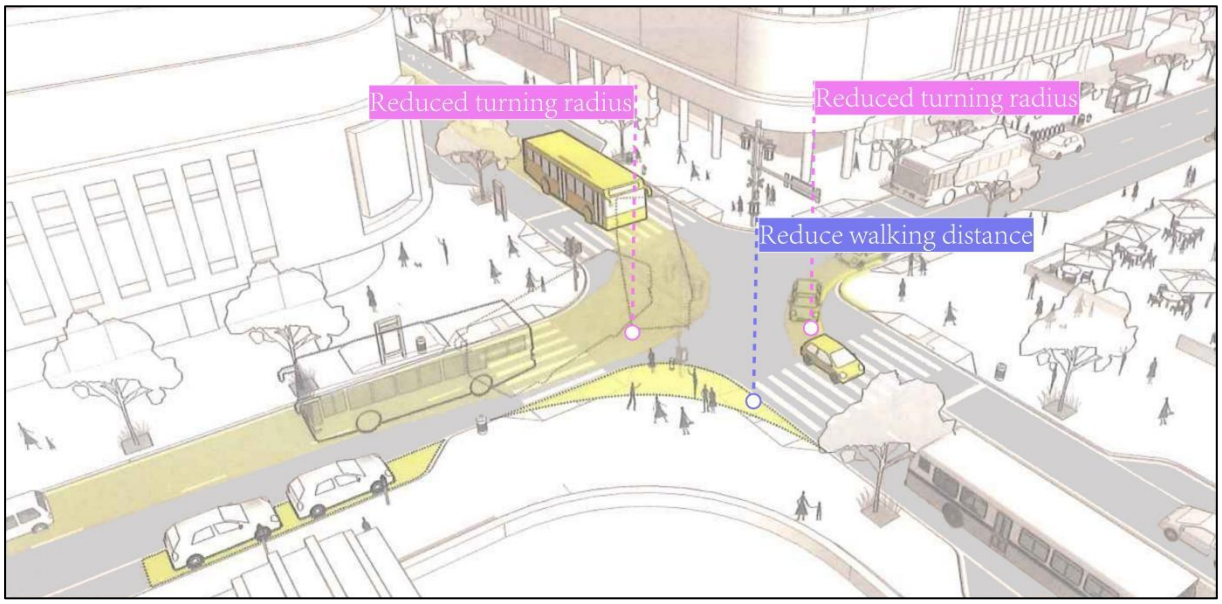

Figure 6-33 Pedestrian crossing design Resources: Self-drawn by the author

② Pedestrian Crossing Variable Section Road Design

Pedestrian crossing is an important part of the slow traffic design and requires the provision of a secondary crossing stopping area for pedestrians to shorten the crossing distance and improve pedestrian safety. For the narrower roads in this scheme, a variable section road design can be used to make the pedestrian crossing distance shorter and to alert motorists to the view and improve safety for pedestrians crossing the street(Figure 6-34).

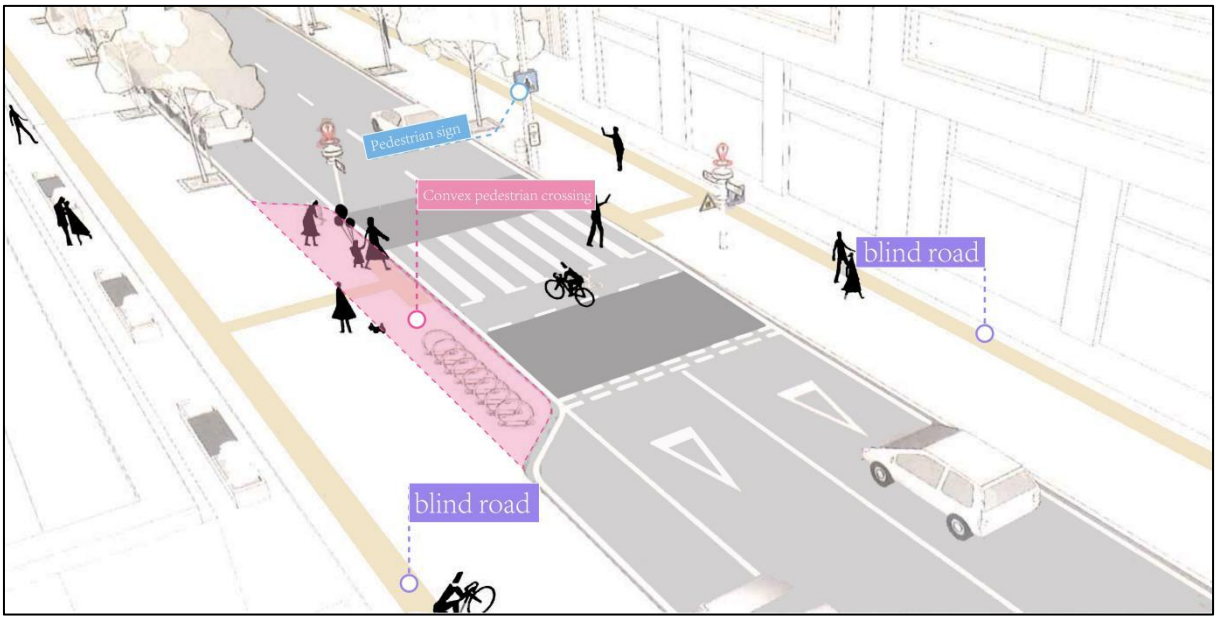

Figure 6-34 Pedestrian Crossing Variable Section Road Design Resources: Self-drawn by the author

6.4.2 Slow traffic environment design

slow traffic activities are not just about providing good slow traffic paths, but also about creating a good slow traffic environment for slow movers through relevant supporting slow traffic public facilities. This design proposes a complete set of design suggestions for the slow traffic environment in terms of the combination of traffic signage facilities, traffic interchange facilities, urban furniture facilities, greening and fitness facilities and environmental sanitation facilities.

(1) Traffic signage facility combination design

Traffic signs should be multi-functional, with integrated design for signage, signalling and street lighting(Figure 6-35).

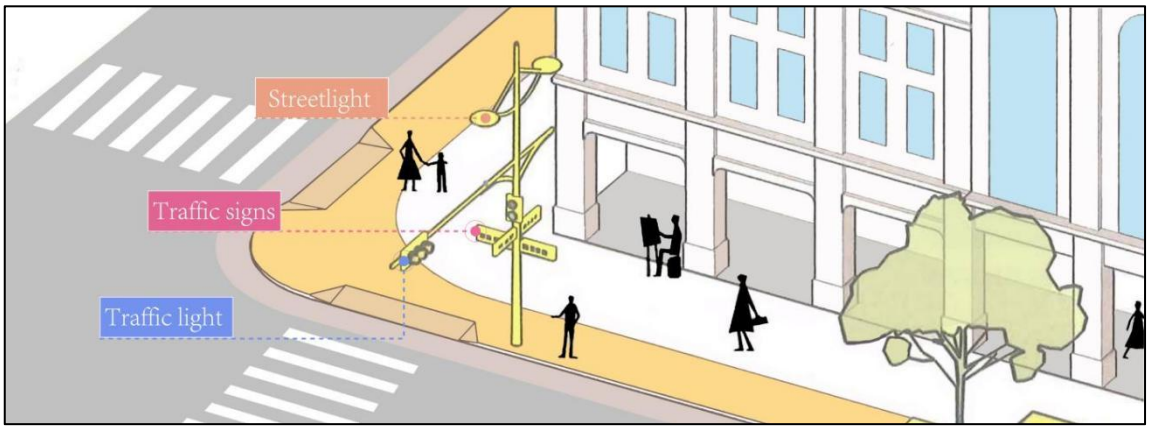

Figure 6-35 Traffic signage facility combination design Resources: Self-drawn by the author

（2）Public transport interchange combination design

Convenient transport interchanges and connections, combining signage, bus stops, taxi stands and bicycle parking(Figure 6-36).

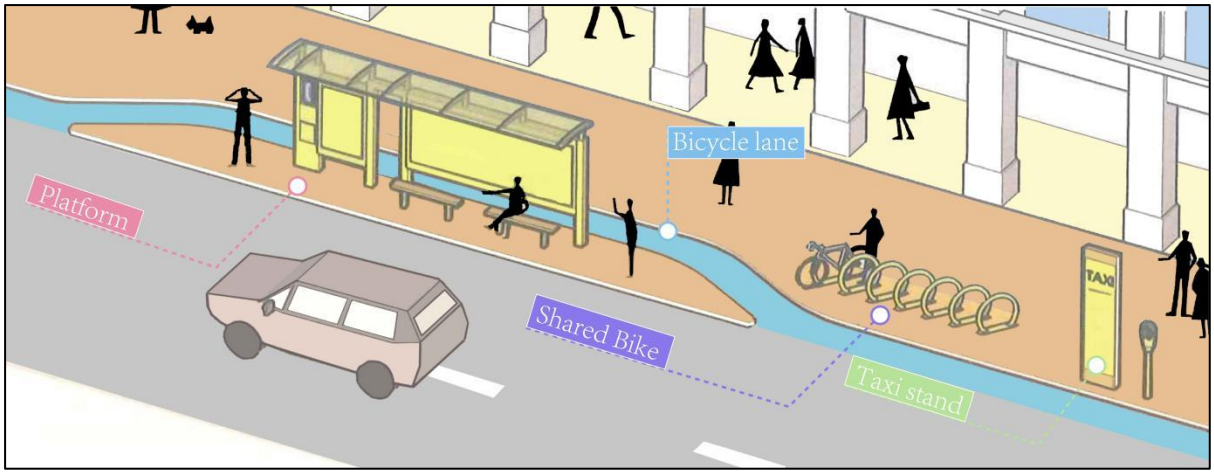

Figure 6-36 Public transport interchange combination design Resources: Self-drawn by the author

（3）Urban furniture and facilities combination design

Combination of convenient service facilities, including seating, smart charging and hand-washing facilities (direct drinking water)(Figure 6-37).

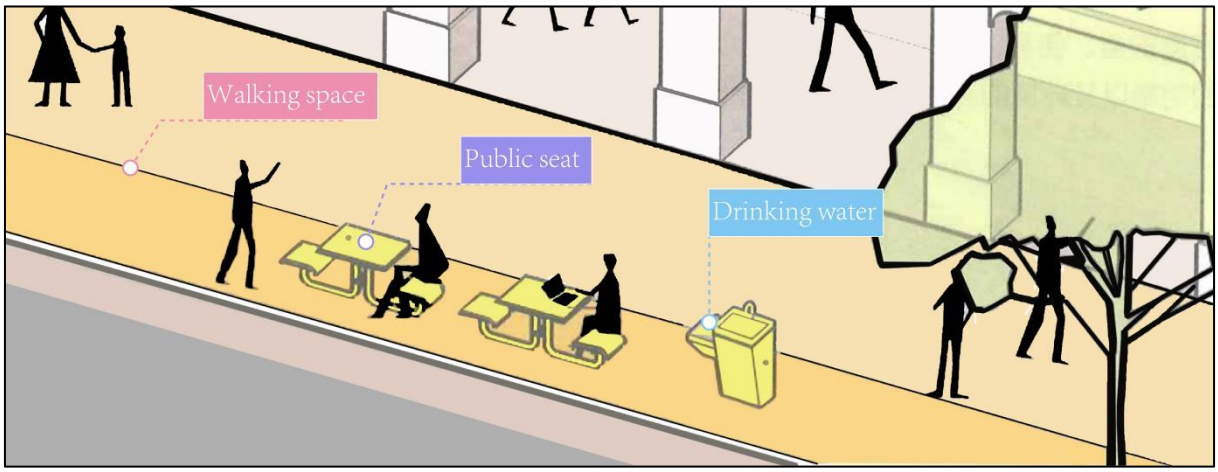

Figure 6-37 Urban furniture and facilities combination design Resources: Self-drawn by the author

（4）Greenery and fitness facility combination design

Combination of hedge planters, public art and fitness facilities(Figure 6-38).

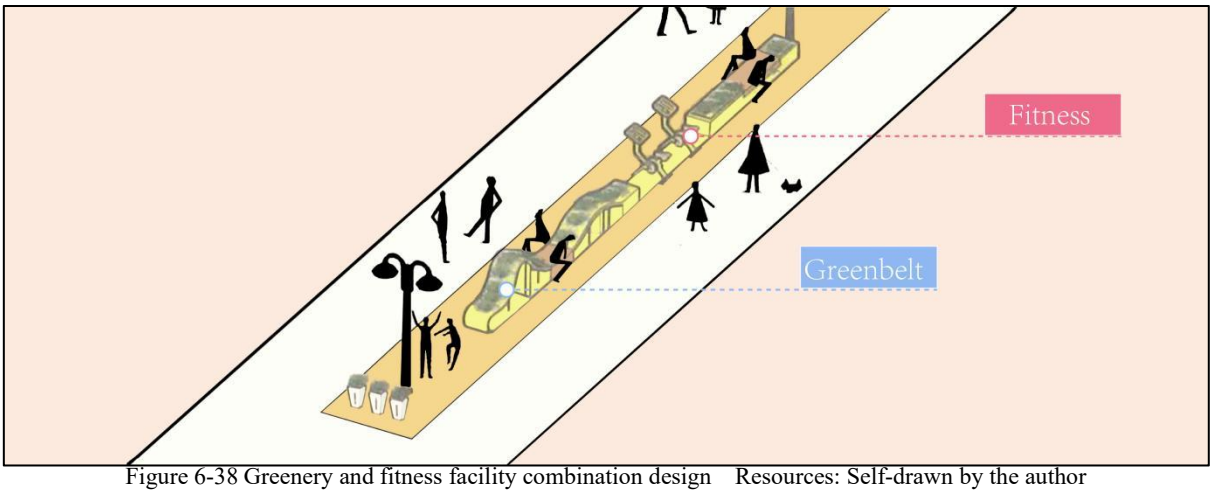

Figure 6-38 Greenery and fitness facility combination design Resources: Self-drawn by the author

（5）Environmental sanitation combination design

The boutique sanitary facilities are designed with integrated portable toilets and sanitary tool rooms, and the toilets of the surrounding shops are open to the public(Figure 6-39).

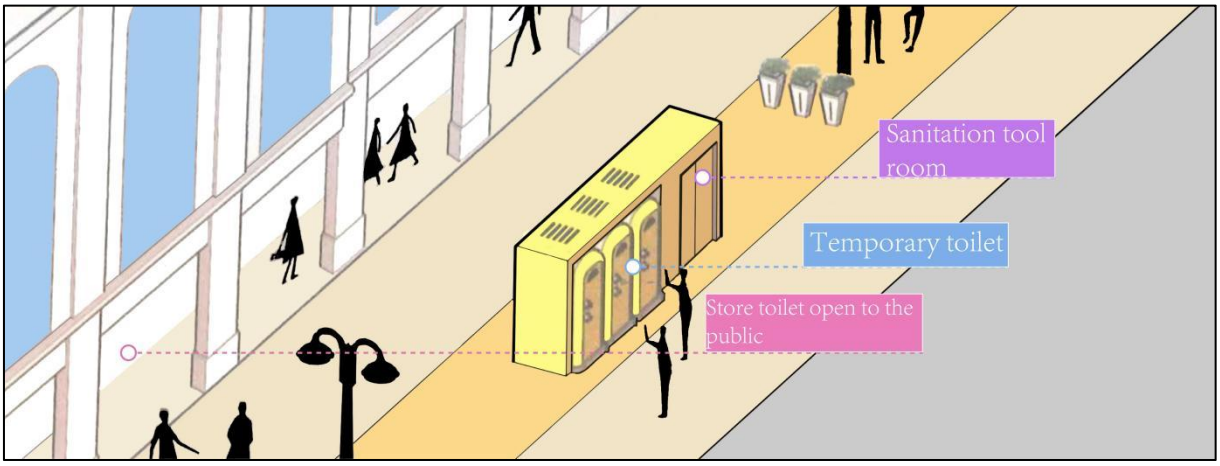

Figure 6-39 Environmental sanitation combination design Resources: Self-drawn by the author

The above proposals for the design of the slow-moving environment will provide a convenient and good slow-moving experience for slow movers on the Racecourse plot.

6.5 Chapter summary

This chapter applies the urban design strategy of the slow-moving concept summarised in Chapter 5 through a practical study of the design of the Racecourse plot. On the one hand, the

overall urban design of the Racecourse plot is carried out through the slow walking concept. On the other hand, detailed design suggestions are also made for each slow walking environment, nodes, etc. This can be summarised as follows:

Optimising spatial layout and structure: By re-integrating the urban space around the site, the continuity and connectivity of public space will be enhanced to provide a good spatial environment for slow travel. It is proposed that the urban green spaces, public facilities and residential areas around the Guangzhou Racecourse plot be interconnected to form a unified spatial network.

Enhancing the urban slow walking environment: The road network and land use of the Racecourse plot is re-planned to open up the connections between the Racecourse plot and the surrounding urban slow walking system to create a comfortable urban slow walking environment. Encourage public travel, such as walking and cycling trips, to reduce the use of motor vehicles, thereby reducing urban traffic pressure and environmental pollution.

Improve slow traffic facilities: optimise the slow-moving road system and install dedicated walking and cycling paths to improve the convenience and safety of slow-moving travel. Also, increase the number of public bicycle rental points to encourage more residents to choose green modes of travel.

Enriching public service facilities: Making full use of the existing buildings and road network within the site, a series of public service facilities are planned and built, such as a cultural activity centre, a sports hall and children's play facilities, to provide residents with a diversified space for leisure activities and enhance community cohesion.

Conclusion

Research summary

This research proposes a series of specific urban design strategies through an in-depth analysis of the value and significance of the slow-moving concept in the context of urban renewal, using the Guangzhou Racecourse plot as an example. These strategies aim to optimise the traffic layout, improve the quality of public space, preserve history and culture, improve the quality of life of residents, and create more economic, social and environmental benefits for urban development. In practice, the proposed urban design strategies for the slow-moving concept have demonstrated their effectiveness and feasibility, providing strong support for solving problems in the urban renewal process.

Through the analysis of the Guangzhou Racecourse plot, this study provides a series of specific design strategies and design proposals, such as setting up a slow walking area, planning a slow traffic cores, improving the interface between public transport and the slow traffic system, creating a rich urban slow traffic space, and designing slow traffic nodes. These strategies will not only help to solve problems in the urban renewal process, but also create a more resilient, liveable and inclusive development environment for the urban area.

In conclusion, the slow-moving concept urban design strategy is important for promoting high-quality urban renewal. This research shows that incorporating the slow-moving concept into urban renewal and urban design strategies can help to achieve sustainable urban development, environmental improvement, economic prosperity and social inclusion. It helps to create a more livable urban environment, improve the quality of life of residents, strengthen the historical and cultural heritage of the city and promote green urban development. In the future, we should further focus on the long-term effects of urban design strategies for the slow traffic Concept, encourage residents to participate in the urban renewal process and actively explore innovative implementation methods with a view to providing more comprehensive and systematic solutions for urban development. In this process, policy makers, urban

planners and designers should work together to deeply integrate the slow-moving concept into the urban design process and contribute to building a harmonious, prosperous and sustainable urban development.

Research deficiencies and perspectives

（1）Research deficiencies：

1. This research focuses on the Guangzhou Racecourse plot as an example, and may not fully reflect the general application of the slow-moving concept in urban renewal processes in other cities and regions. Future research could expand the scope of the research to include more different types of cities and regions in order to explore more comprehensively the applicability of the urban design strategy of the slow-moving concept in different contexts.

2. In proposing an urban design strategy for the slow-moving concept, some of the detailed issues related to practical implementation, such as economic benefit analysis, policy development and implementation, may have been overlooked and need to be added to in subsequent researches.

3. This research mainly explores the application of the slow-moving concept in the urban renewal process at a macro level, and further attention can be paid to the implementation of the slow-moving concept in specific design elements and technical means in the future.

4. This research has paid less attention to policy and institutional level factors, and may have overlooked their role in the implementation of urban design strategies for the slow traffic Concept. Future research should focus more on the policy and institutional environment and analyse how they influence the promotion and implementation of the slow traffic concept.

5. This research has paid less attention to the long-term effects of the slow-moving concept urban design strategy, and may not be able to fully assess its sustained effects in the urban renewal process. Future research should focus on the long-term effects of the strategies after

implementation, through regular collection and analysis of relevant data and information, in order to more accurately assess the long-term effects of the urban design strategies of the slow traffic Concept on sustainable urban development, residents' quality of life and environmental improvements. In addition, long-term tracking and evaluation can provide useful feedback for strategy adjustment and optimisation, and help us to continuously improve the urban design strategy of the slow traffic concept in practice.

（4）Research perspectives

1. In-depth study of urban regeneration projects in other cities or regions to validate and optimise the urban design strategy of the slow-moving concept proposed in this study, with a view to making it more widely applicable and universal.

2. In the future, attention can be paid to the application of new technologies and design methods in the urban design strategy of the slow-moving concept, such as intelligent transportation systems and green building technologies, with a view to further improving the scientific and feasibility of the urban design strategy.

3. Encourage interdisciplinary research and cooperation, integrating theories and methods from multiple disciplines such as urban planning, traffic engineering and environmental science into the study of urban design strategies for the slow-moving concept, with a view to providing more comprehensive and systematic solutions for urban regeneration projects.

4. Focusing on the social effects and the level of residents' participation in the urban design strategy of the slow walking concept. In future research, more attention can be paid to the needs and wishes of residents, and through effective communication and participation mechanisms, the recognition and participation of residents in the urban design strategy of the slow-moving concept can be increased, thus achieving a more inclusive and sustainable urban regeneration.

5. Continuously monitor and evaluate the long-term effectiveness of the urban design strategy for the slow traffic Concept in practice. Through regular data collection and analysis, the actual effectiveness of the proposed strategies in the urban regeneration process will be assessed in order to continuously optimise and improve the design strategies and promote sustainable urban development.

6. In conclusion, this research has achieved certain results in the study of urban design strategies for the slow traffic concept, but there are still some inadequacies. In the subsequent research, we should pay more attention to the problems mentioned above, with a view to further improving the theoretical system and practical application of the urban design strategy of the slow traffic concept, so as to provide stronger support for achieving sustainable urban development, high quality of life and environmental improvement.

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Appendix

Questionnaire survey on slow traffic and slow movers around the Racecourse plot

Hello, I am a postgraduate student at xxx University and I would firstly like to thank you very much for helping me to fill in this questionnaire. This questionnaire is anonymous and the information you provide will be used for scientific research only and will be treated in strict confidence. I wish you a happy life.

1.What is your gender?

A. Male

B. Female

2.What is your age?

A. Under 18 years old

B. 18-24 years old

C. 25-34 years old

D. 35-44 years old

E. 45-54 years old

F. 55 years and above

3. What is your occupation?

A. Student

B. Worker

C. Freelancer

D. Retired

E. Other (please specify)

4. What is your educational background?

A.Bachelor's degree and above

B.Junior college

C.High school

D.Junior high school and below

5.What is your approximate monthly household income?

A. Less than RMB5,000

B. 5,000-10,000 RMB

C. 10000-20000 RMB

D. RMB20,000-30,000

E. Above RMB30,000

6. Which mode of transport do you usually use to get around?

A. Public transport (e.g. bus, metro)

B. Private car

C. Bicycle or electric car

D. Walking

E. Other (please specify)

7. What is the distance you usually travel?

A. 1km or less

B. 1-3km

C. 3-5km

D. 5-10km

E. 10km or more

8. When you need to make a trip of more than 3km, which mode of transport do you usually use?

A. Public transport (e.g. bus, metro)

B. Private car

C. Bicycle or electric vehicle

D. Walking

E. Other (please specify)

9. When you need to make a trip of less than 3km, which mode of transport do you usually use?

A. Public transport (e.g. bus, metro)

B. Private car

C. Bicycle or electric bike

D. Walking

E. Other (please specify)

10. What is the reason you usually choose to travel?

A. To go to work/school

B. Shopping/entertainment

C. To visit family/friends

D. Exercise/leisure

E. To do business/work

F. Other (please specify)

11. How good do you think the slow traffic facilities (e.g. cycle paths, footpaths) are in the Racecourse plot area?

A. Very good

B. Better

C. Fair

D. Poor

E. Very poor

12. In your daily travels, do you avoid using slower modes of transport (e.g. bicycles, electric bikes, walking) because of safety concerns?

A. Yes

B. No

13. How do you think the traffic congestion in your area is at present?

A. Very serious

B. Severe

C. Fair

D. Moderate

E. Very mild

14. Do you think the development of slow traffic can help relieve traffic congestion in the city?

A. Yes

B. No

C. Not sure

15. Do you support the designation of dedicated space for slow traffic facilities (e.g. cycle paths, footpaths) in urban design?

A. Yes

B. No

C. Not sure

16. Do you think the government should invest more to improve the quality and quantity of slow traffic facilities?

A. Yes

B. No

C. Not sure

17. In urban design, do you support the division of part of the road space into dedicated cycle lanes and footpaths to improve the safety and convenience of slow moving traffic?

A. Yes

B. No

C. Not sure

18.Which slow traffic facilities do you think are necessary in the vicinity of the Racecourse plot? (multiple answers possible)

A. Pedestrian walkways

B. Bicycle lanes

C. Electric vehicle lanes

D. Public bicycle/electric vehicle rental points

E. Bicycle/electric vehicle parking facilities

F. Accessibility facilities (e.g. ramps, blind alleys)

G. Other (please specify): _____

19.What measures do you think should be taken to increase the use of slow traffic during the Racecourse plot activities? (multiple answers possible)

A. Establish temporary cycle lanes and footpaths

B. Provide free bicycle/electric vehicle rental service

C. Provide priority bicycle/electric vehicle parking areas

D. Enhance safety management and promotion of slow-moving traffic

E. Effective linkage with public transport

F. Other (please specify): _____

20.For the Racecourse plot activity, would you like to participate in an activity where slow traffic is the main mode of travel (e.g. bicycle ride, walking tour, etc.)?

A. Yes

B. No

C. Not sure

21.What do you think are the advantages of slow traffic travel during the Racecourse plot activities? (multiple answers possible)

A. Reduced traffic congestion

B. Save travel time

C. Environmental protection and emission reduction

D. Good for your health

E. Increase participation and experience of the activity

F. Other (please specify): _____

22.Would you prefer to travel by slow traffic if the slow traffic facilities around the Racecourse plot were improved?

A. Yes

B. No

C. Unsure

23.What facilities or policies in urban design do you think would encourage more residents to choose slow traffic to get around? (multiple answers possible)

A. Optimise the layout of urban roads to reduce the travel time of slow traffic

B. Improve the connectivity between public transport stations and slow traffic facilities

C. Establish priority areas for slow-moving traffic and restrict motor vehicles

D. Establishing comprehensive parking facilities for bicycles and electric vehicles

E. Provide incentives for slow traffic travel (e.g. free bicycle rental)

F. Other (please specify): _____

24.Which of the following factors do you think is most critical in urban design to enhance the attractiveness of slow traffic? (multiple answers possible)

A. Providing well-developed cycle paths and footpaths

B. Increased greening and landscaping of slow traffic facilities

C. Improving the accessibility of public transport to slow traffic interchanges

D. Increase the number of public bicycle and electric vehicle rental points

E. Improving safety facilities and traffic management for slow-moving traffic

F. Others (please specify): _____

25. Please rate your expectation and approval of the following modes of travel (a score of 1 means very undesirable, 5 means very desirable) and provide your reasons below.

A. Development of public transport for travel:

1 2 3 4 5

Reason (optional): _____

B. Development of private car travel:

1 2 3 4 5

Rationale (optional): _____

C. Development of slow traffic trips (e.g. cycling, electric vehicles, walking):

1 2 3 4 5

Rationale (optional): _____

攻读硕士学位期间取得的研究成果

一、已发表（包括已接受待发表）的论文，以及已投稿、或已成文打算投稿、或拟成文投稿的论文情况**（只填写与学位论文内容相关的部分）：**

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