Sustainable Urban Mobility Plan
Foshan Pilot Project

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■ **Project**

The Sino-German Cooperation on Low Carbon Transport project (CLCT) is commissioned by the International Climate Initiative (IKI) of the German Federal Ministry for Economic Affairs and Climate Action (BMWK). The CLCT project is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in close collaboration with the Ministry of Transport (MoT) of the People's Republic of China.

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Funded by the International Climate Initiative (IKI), the Sino-German Cooperation on Low Carbon Transport (CLCT) project is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, in partnership with the Ministry of Transport of the People's Republic of China (MoT). The project aims at strengthening cooperation between Germany and China in the field of climate protection in the transport sector. The overarching aim of the CLCT project is to support Chinese policy makers and relevant governmental authorities at national and sub-national levels on the development of effective and efficient implementation strategies and policies to further carry out the long-term goals for the carbon neutrality of China's transportation sector.

Under the umbrella of the CLCT project, the concept of Sustainable Urban Mobility Planning (SUMP) is intended to be promoted in China as a key planning tool to support the country's ambition to foster integrated transport and mobility planning and shift to a low-carbon transport system. The city of Foshan is proposed as a pilot city to explore the feasibility, localised process, and potential impacts of SUMP in the Chinese context.

In the summer of 2021, a pilot project on SUMP in the city of Foshan, located in the central part of the Guangdong Province in the Greater Bay Area in South China, was jointly launched. This first application of the SUMP concept in China aims to support the city of Foshan in its ambition to further promote low carbon, green and human-centred mobility. The SUMP project was rolled out in collaboration with the Transport Bureau of Foshan (Foshan TB), Foshan Public Transportation Management Co. LTD (Foshan TC), the China Sustainable Transportation Center (CSTC), the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, and was also supported by Rupprecht Consult.

As a pilot project, the development of Foshan's SUMP was limited to a short period of time, which subsequently constrained the implementation process, which can normally take several years. In this regard, the SUMP process was conducted up to Step 9 of its standard measures (which is also the milestone of Phase III of SUMP systems) at the city level, while specific measures for its immediate implementation were developed at a showcase area level. The pilot project reflected Foshan's city-level vision, objectives, and strategic measures. Potential follow-up actions at the city level – to be taken after the pilot implementation of showcase area measures – were identified, and corresponding financial and monitoring plans were planned be further developed in the future.

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Executive Summary

China aims at peaking carbon dioxide emissions before 2030 and achieving carbon neutrality by 2060. To advance actions on this 'dual carbon' goal, the "Action Plan for Carbon Dioxide Peaking before 2030"[1] was issued by the State Council in 2021. Taking action by promoting green and low-carbon transportation is one of the key tasks in these policies. In response to this goal, cities such as Beijing and Shanghai put a focus on developing green, high efficiency transportation systems as part of their "14th Five-Year Plan in Comprehensive Transport Development". Foshan, being one of the pilot cities of China's National Transit Metropolis Demonstration Project (TMDP), has also established its own action plan – the "Foshan Green Mobility Action Plan" in 2020, striving to achieve a 70% share in green mobility (in the downtown area) and an 80% satisfaction rate towards switching to green travel services by 2022.

The concept of a Sustainable Urban Mobility Plan (SUMP) is intended to be promoted in Foshan as a key planning tool to support the city's ambition to achieve their green mobility target. Through wider stakeholder engagement and active public participation as part of the planning process, in comparison to traditional transportation planning, the Foshan SUMP aims at providing a more practical and comprehensive vision to the city that fosters climate friendly urban transport while reflecting the needs of both transportation stakeholders and citizens.

The SUMP process was conducted in Foshan up to the development of the plan's needed measures, with the remaining steps of the SUMP process – including the managing of the plan's implementation, monitoring, and review – to be spearheaded by relevant authorities upon their takeover of the project. The measures of the Foshan SUMP were established at two parallel scopes: strategic measures to be taken at the city-level, serving as policy suggestions for local authorities in future planning; and specific measures taken at a showcase level, to be implemented in a designated showcase area within established timeframes upon adoption of the plan, to showcase the potential and impact of measures developed for transport systems, following the SUMP methodology. Both sets of measures reflect the visioning process conducted at the city-level with the involvement of local stakeholders, captured in the common vision for a Foshan with a "mobility environment that is green and people-centred by 2035" (see Section 4 – Vision and Objectives). The plan suggests the following specific measures – described in detail under Section 6.3 – to be implemented in the showcase area, under the overall strategies developed with local stakeholders and with a focus on intermodal options, public transport, active mobility, and maintaining a jobs-to-housing balance:

(1) Creating safe routes to school,
(2) Bike lane upgrading,
(3) Microcirculation bus lines.

By carrying out SUMP in Foshan, the pilot project also seeks to provide a localised planning methodology and replicable approach for policy makers and planners in other cities to further integrate the SUMP concept into transport and mobility planning systems in the Chinese context.

[1] The State Council of the People's Republic of China. Action Plan for Carbon Dioxide Peaking Before 2030. [EB/OL], (2021-10-27) [2022-12-22]. http://english.www.gov.cn/policies/latestreleases/202110/27/content_WS6178a47ec6d0df57f98e3dfb.html

1 Introduction

1.1 Project Background and Additional Value

Human emissions of carbon dioxide and other greenhouse gases are a primary driver of climate change and present one of the world's most pressing challenges. China's total carbon emissions reached 9.3 billion tons in 2017[2], of which the transportation sector generated the third largest share. With the acceleration of urbanisation in China, the transportation sector's share of carbon emissions has gradually increased, resulting in an urging of pressure for further carbon reduction action.

China's National 2060 Carbon Neutrality Target

At the 75th Session of the United Nations General Assembly, Chinese President Xi Jinping announced that China is going to peak carbon dioxide emissions before 2030 and achieve carbon neutrality by 2060 ('dual carbon' goals). This pledge has received great attention internationally and is seen as a major commitment to fight against the climate crisis. In 2021, the "Action Plan for Carbon Dioxide Peaking before 2030" was published by the State Council of the People's Republic of China. The plan has fostered the construction of a low-carbon transport system. Also, a "Green Mobility Action Plan" was issued by the Ministry of Transport and the National Development and Reform Commission (NDRC) in 2020[3], to change citizens' travel behaviours and promote a greener lifestyle.

Foshan's Ambition Towards Sustainable Transport Development and Carbon Neutrality

Foshan, being one of the pilot cities of China's National Transit Metropolis Demonstration Project (TMDP), has taken this opportunity for building an integrated multi-modal public transport system with the simple aim of shifting away from the use of private cars and boosting the use of public transport, promoting a greener lifestyle and cleaning up the air, thus contributing to the carbon neutrality target. In response to this, Foshan has also established its own action plan – the "Foshan Green Mobility Action Plan" in 2020, striving to achieve a 70% share in green mobility (in the downtown area) and an 80% satisfaction rate towards switching to green travel services by 2022.

Additional Value of Foshan SUMP Pilot Project

Through wider stakeholder engagement and public participation as part of the Sustainable Urban Mobility Plan (SUMP) process, in comparison to ongoing green transportation planning in Chinese cities, the SUMP Pilot Project aims at providing a more practical and comprehensive vision to the city of Foshan that fosters climate friendly urban transport while reflecting the needs of both transportation stakeholders and citizens. The Foshan SUMP project applied a survey method to engage citizens' voices. The survey has shown that with public participation, the strategy directions could better cater to the actual needs of citizens.

The SUMP Project also tried to break down departmental boundaries between departments of transport planning, urban planning and natural resources, and encourage interdepartmental involvement from the initial stage of the planning process, thus ensuring support and cooperation in the implementation stage.

The pilot SUMP can eventually help introduce Foshan to the world and make it a carrier of Chinese cities' best practices. The plan provides a bridge for exchanges on international experiences and contributes to expanding and grounding the idea of how people-centred planning from different countries can be rolled out within different political and cultural contexts.

1.2 Roadmap of the SUMP

With the Guidelines for Developing and Implementing a SUMP being a planning methodology pursued by

[2] Chinese Central Government official website, "Notice on the Publication of the 'Green Mobility Action Plan' by the Ministry of Transport and the National Development and Reform Commission" (in Chinese), July 2020. http://www.gov.cn/zhengce/zhengceku/2020-07/26/content_5530095.htm.

[3] OECD, "Environment at a Glance: Climate Change," December 2019, https://www.oecd.org/environment/environment-at-a-glance/Climate-Change-Archive-December-2019.pdf; "Environment at a Glance: Indicators," February 2021, https://www.oecd.org/environment/environment-at-a-glance/Environment%20at%20a%20Glance%20Indicators%20Climate%20change-Jan-Feb%202021.pdf.

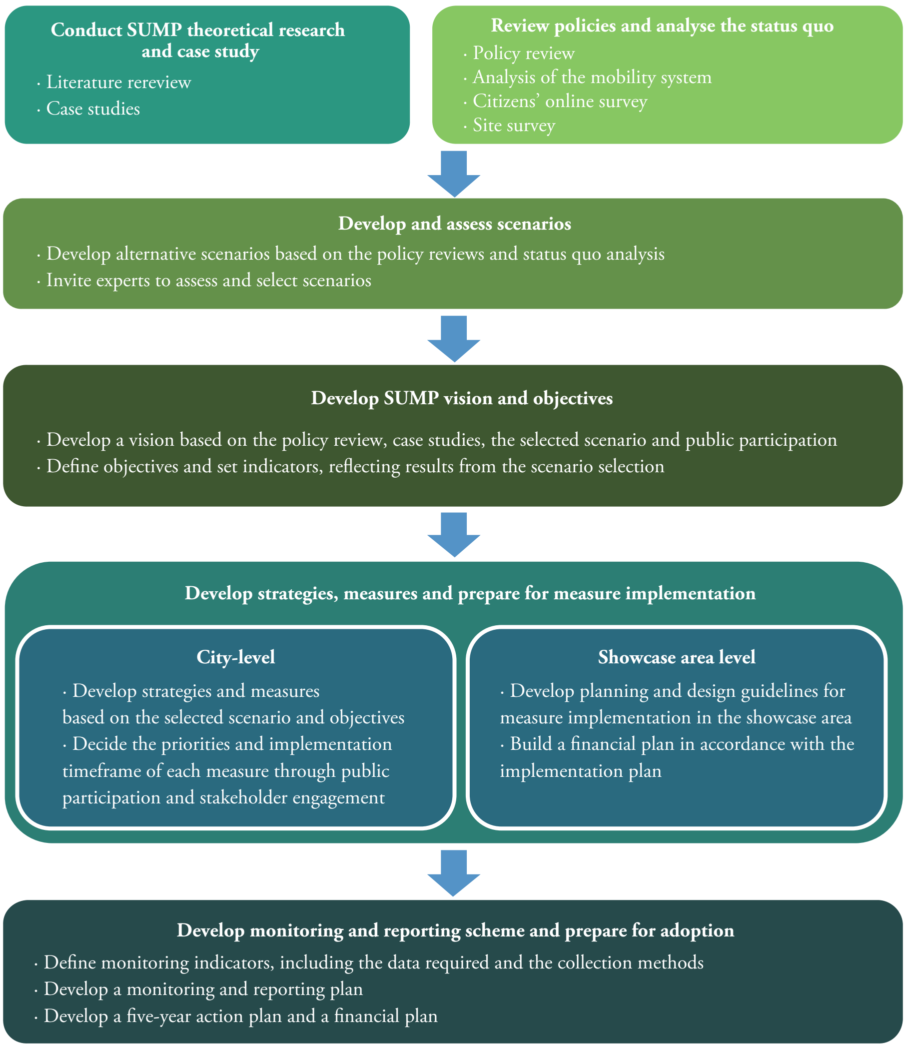
the European Commission and implemented widely in Europe, the project roadmap (Figure 1-1) is developed based on the lessons learned from case studies of European SUMP, projects while taking into account Foshan's local conditions. The roadmap of SUMP serves as an action guide for conducting the Foshan SUMP, and includes two features that distinguish it from other transportation planning processes in Foshan and contribute to the goal of a mobility environment that is green and people-centred.

(1) Public engagement. When compared to the ongoing Green Transportation Planning in Chinese cities, the SUMP process includes more stakeholder and public participation opportunities. The Foshan SUMP project also applied a survey method to engage citizens and collect their opinions.

(2) Comprehensive consideration of external factors (such as national policy towards large-scale metro construction) and Foshan's local characteristics (such as scattered urban clusters, large inter-city commuting demands and short average travel distances within clusters). This consideration is reflected in the scenario developing process.

Additionally, developing a SUMP showcase area within Foshan for the implementation of the SUMP is a practical way of introducing an international planning method in China. Therefore, besides city-level mobility planning activities, measures for the development of a concrete pilot community were included as well.

Figure 1-1 Roadmap of the SUMP



1.3 Stakeholder Engagement and Public Participation

Stakeholder engagement and public participation are recognised as the most important drivers that enable the effective implementation of SUMPs and distinguish these plans from traditional Chinese planning processes. From the preparation stage, workshops, questionnaires, and on-site community engagement activities (see Figures 1-2 and 1-3) were organised to reveal citizens' concerns and insights regarding mobility in Foshan. Relevant stakeholders and local experts were then gathered to build a common vision for Foshan's future mobility, develop related objectives and measures, and select the best scenario for a SUMP in their local context. Afterwards, community representatives and transport and urban planners were engaged to create a measure package for the Chancheng showcase area and give suggestions based on the specific characteristics of the pilot location. Subsequently, key decision makers, stakeholders and local experts were invited to review and comment on the draft SUMP. Eventually, relevant decision makers and stakeholders were involved to discuss their budget and implementation responsibilities (Figure 1-4).

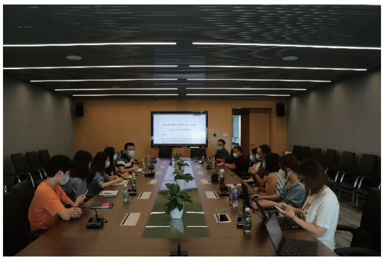
In particular, the questionnaire survey used in the pilot served to be an important factual basis for the formulation of the Foshan SUMP. In September 2021, an online questionnaire survey and on-site community engagement activities were carried out to hear voices from locals, understand their current travel habits, explore their perceptions and attitudes towards different modes of transport, gather insights about motivational factors which might cause a switch from driving to more environmentally friendly modes of transport, such as public transport, walking and cycling, as well as collect opinions on the priority of different measures regarding the enhancement of the green travel environment and experiences. A total of 2,849 questionnaires were collected, covering all age groups and people of different occupations (see Figure 1-5).

Two on-site community participation activities were organised in Gaoming District and Chancheng District, and more than 200 questionnaires were collected from residents of these two districts, respectively. The remaining questionnaires were distributed online, and opinions of a total of more than 2,400 respondents were collected from five administrative districts in Foshan City. Samples were distributed across various age ranges, diverse occupation groups and different geographical areas in Foshan, in order to obtain a high level of representativeness of the data. An analysis of the survey results (integrated with specific references into Section 2 of this report) showed a common appeal among the respondents for metro development, bus service improvement, active mobility environment enhancement, and public transport system integration, which was reflected as one of the bases of the status quo analysis (see, for example, Section 2.3 on Key Challenges). Some limitations on the representativeness in the data collected remained, for example, the relatively high proportion of younger people among all respondents (a total of 87.3% respondents were aged 18-40 years old, which is even higher than the statistics of the population aged 15-59 of the city[4]) and the lack of information about the respondents' gender could lead to potential disproportional sampling in the districts.

However, the reliability of the survey results was confirmed through stakeholder discussions. Local stakeholders and experts recognised the factual basis of the survey results, and the results thereby informed further debate among stakeholders throughout the visioning processes and measures development. The broad spectrum of participants in the public surveys, and the validity of their results helped guarantee the utilisation of the survey results analysis to guide the overall vision, objectives, strategies, and measure development in stakeholder discussions, ensuring the SUMP reflected Foshan's characteristics and the input of its citizens. Specific results from the survey are prominently referenced in Section 2, which presents an analysis of the status quo of Foshan's mobility systems.

[4] Among the permanent residents of Foshan, the population aged 15-59 is 7.0645 million, accounting for 74.37%, derived from the Communiqué of the Seventh National Census of Foshan City (2020)

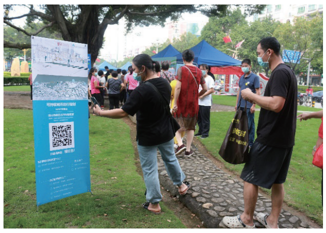
Figure 1-2 Stakeholder Workshops: Identifying the Key Challenges in Foshan's Mobility




(Source: CSTC)

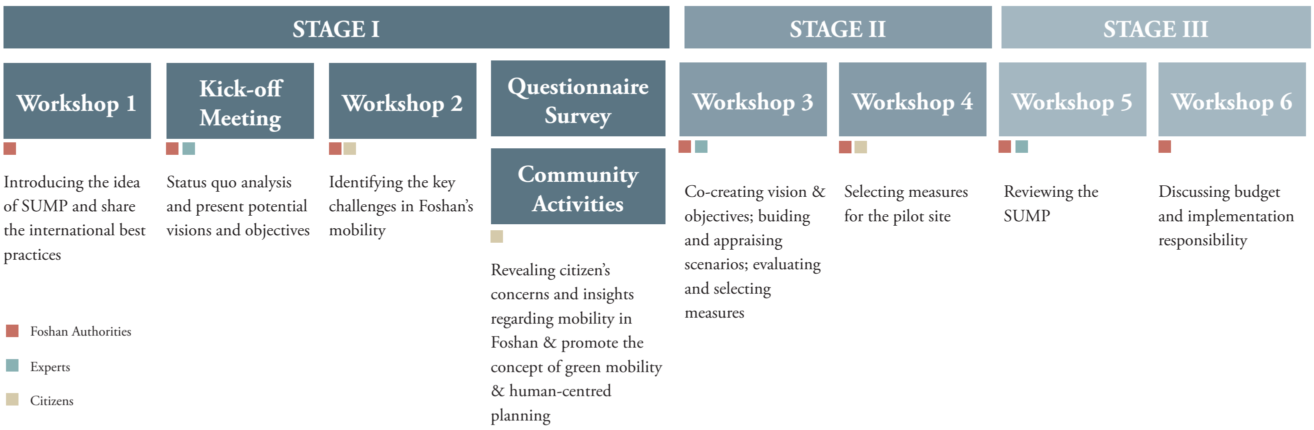
Figure 1-3 Questionnaire Survey and On-site Community Engagement Activity During Public Transport Week





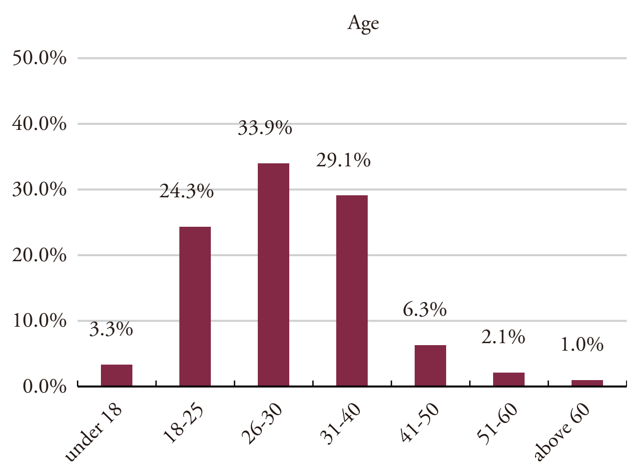

(Source: CSTC)

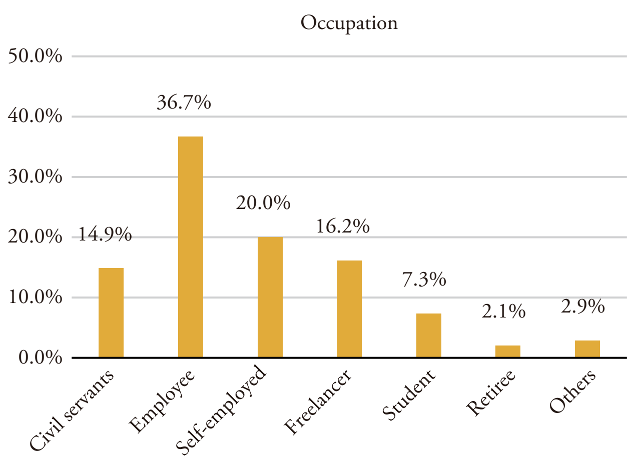
Figure 1-4 Stakeholder Engagement and Public Participation Plan



(Source: CSTC)

Figure 1-5 Respondents' Profiles





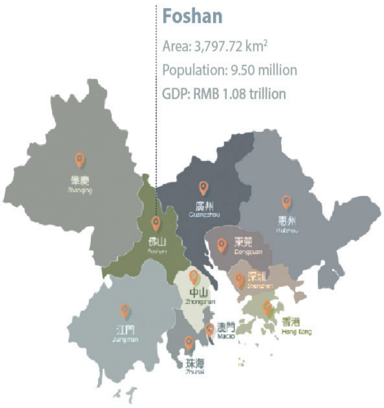
(Source: CSTC)

2 Foshan Today

2.1 Overview of Foshan

Foshan, located in the central part of Guangdong Province, is considered an important node in the Guangdong-Hong Kong-Macao Greater Bay Area (see Figure 2-1). It covers an area of 3,798 km2 and is divided into five administrative districts: Chancheng, Nanhai, Shunde, Gaoming, and Sanshui (see Figure 2-2), with Chancheng being the historical urban core. The city has grown in clusters with a loose urban structure (see Figure 2-3) and most of the clusters have reached a jobs-to-housing balance (see Figure 2-4). The city's population has soared in the last ten years, with a net increase of 2.3 million people, and finally reaching 9.5 million in 2020. Foshan will therefore soon be promoted to having megacity status in China.

Figure 2-1 Location of Foshan in the Greater Bay Area

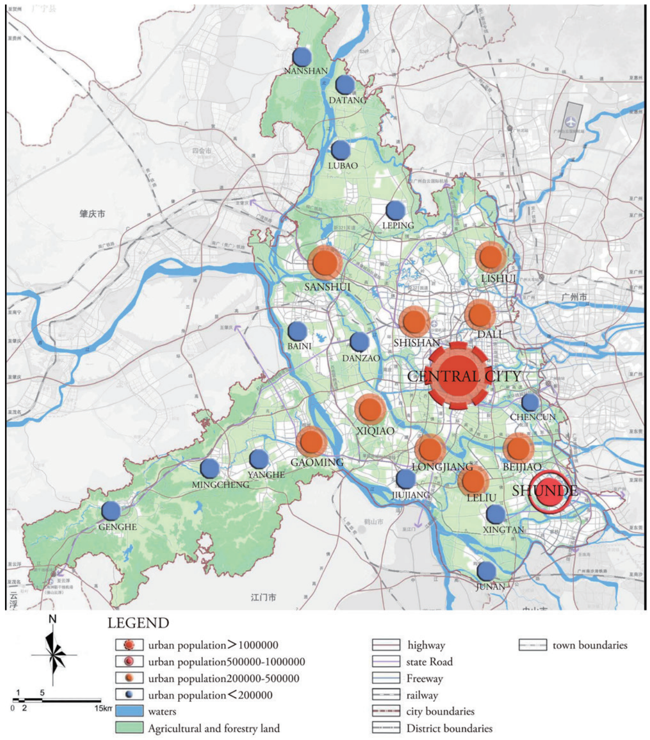


(Source: CSTC)

Figure 2-2 Five Divided Administrative Areas of Foshan

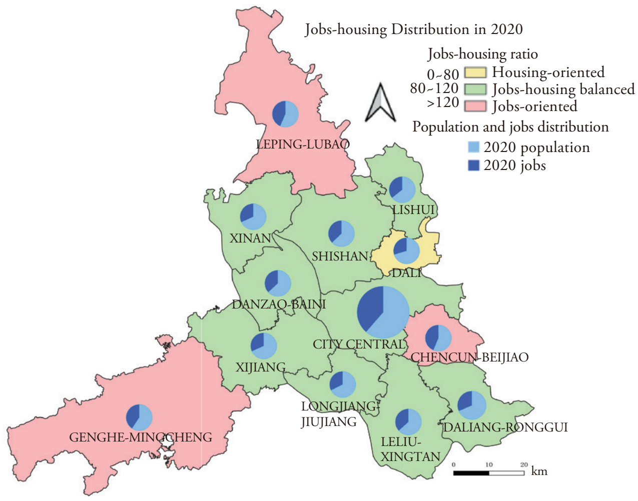
(Source: CSTC)

Figure 2-3 Urban Structure of Foshan



(Source: Foshan 13th Five Year Plan Atlas)

Figure 2-4 Distribution of Population and Jobs



(Source: CSTC)

With a prime geographical location and thriving population, Foshan has made considerable progress in urbanisation and economic development in the past decades. It has a GDP (Gross Domestic Product) exceeding one trillion CNY (Chinese yuan), ranking it the third in Guangdong Province, with an urbanisation ratio reaching 95% in 2019, which is 34.6% higher than the national average.[5]

Foshan is believed to be a vibrant city for young people, with a high proportion of a floating population.[6] Many of these individuals are attracted to work in the city since Foshan is a well-known centre of appliance manufacturing,[7] which gives it high demand for labour. Furthermore, considering its adjacent location to the thriving metropolis of Guangzhou, many workers from Guangzhou tend to live in Foshan to benefit from its lower rents and cost of living.

In spite of its popularity amongst younger populations, Foshan is facing the critical and challenging issue of becoming an "aging city". Therefore, apart from the needs of urban workers, how to shape an elderly-friendly environment should also be considered when planning the city's future urban mobility development.

2.2 Mobility Characteristics

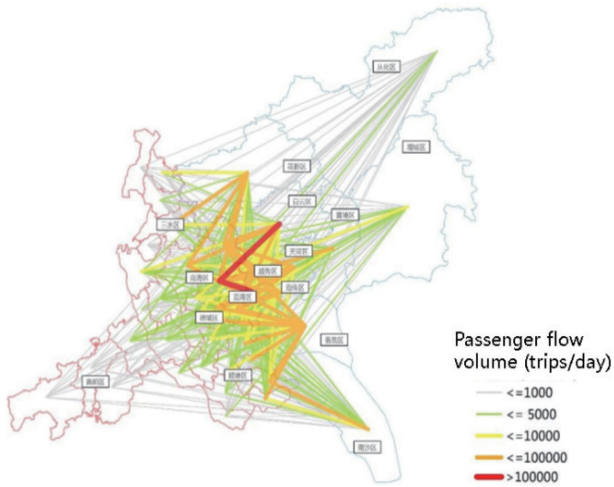
(1) Increasing inter-city travel due to the integrated development of Guangfo city

Under the circumstances of the integrated development of Guangzhou and Foshan as the so-called Guangfo Metropolitan Area, there is a steady increase in the total travel volume between Foshan and Guangzhou, which accounts for 66% of Foshan's total outbound travel volume (see Figure 2-5). The majority of these voyages are commuting journeys between these two cities, in both directions, as 40% of people are living in Guangzhou and working in Foshan while 60% are people who live in Foshan and work in Guangzhou[8]. This mobility pattern has subverted the traditional perspective that Foshan was not a satellite city, but rather a dormitory town to Guangzhou and showed the mutual interactions between these two cities. In addition, it has also revealed that the exchange of travel volume is concentrated at the boundary areas where the two cities meet (see Figure 2-6).

■ Figure 2-5 Distribution of Foshan's Outbound Travel Volume

(Source: Foshan Transport Development Annual Report 2019)

■ Figure 2-6 Distribution of Travel Volume between Foshan and Guangzhou



(Source: Foshan Transport Development Annual Report 2019)

5 Foshan Statistics Bureau. Foshan Annual Statistics Yearbook 2020 [J], Foshan, 2020

6 Foshan Daily. Foshan accelerates the construction of a youth development-oriented city [N]. (2022-5-5) [2022-6-6]. https://www.163.com/dy/article/H6JOLVKS0514A1CA.html

7 The People's Government of Foshan. City Overview [EB/OL], (2022-4-15) [2022-6-6]. http://www.foshan.gov.cn/zjfs/fsgl/csgk/

8 Foshan City Transportation Bureau. Foshan Transport Development Annual Report 2019 [J], Foshan, 2020

(2) Strong reliance on cars

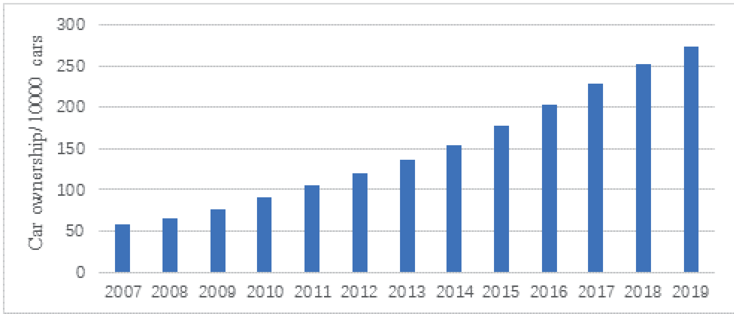
Foshan's car ownership is high and remains in an upward trend (see Figure 2-7), ranking second in the province. The car ownership rate was 1.8 times higher that of Guangzhou, the provincial capital, and 1.3 times higher than that of Shenzhen, the province's economically strongest city.

Figure 2-8 shows that private cars are the dominant transport mode in Foshan. This modal share also increases with the lengthened travel distance. People particularly tend to keep their preference of driving cars when going to a destination which is between 2-10km away from their starting points.[9] This pattern has displayed Foshan citizens' strong reliance on cars, even for shorter distances of travel. In the online survey, Foshan residents reflected that the hot, humid, and rainy weather in Foshan during summer was one of the major reasons that led to the high proportion of private cars being used, due to the higher comfort they provided.

(3) E-bikes becoming the most popular mode for short distance travel within clusters

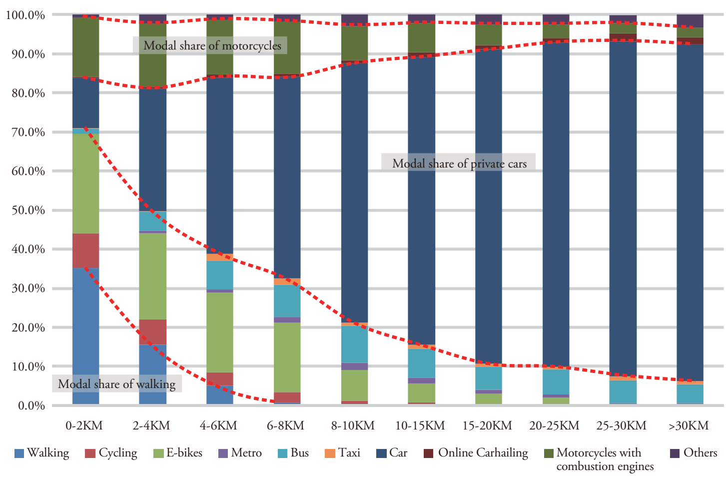
Since motorcycles with combustion engines are restricted in most of the central areas of the five administrative districts, e-bikes are becoming the new prominent alternative vehicle of choice for short distance travel within districts. This trend is reflected in the questionnaire survey and in Figure 28, which demonstrates that e-bikes have an approximate 25% modal share when the travel distance is below 2 km and 20% when the travel distance is between 2 to 8 km.

Figure 2-7 Car ownership, Unit: 10000 cars



(Source: Traffic Police Detachment of Foshan)

Figure 2-8 Modal Split of Different Travel Distances (2020)



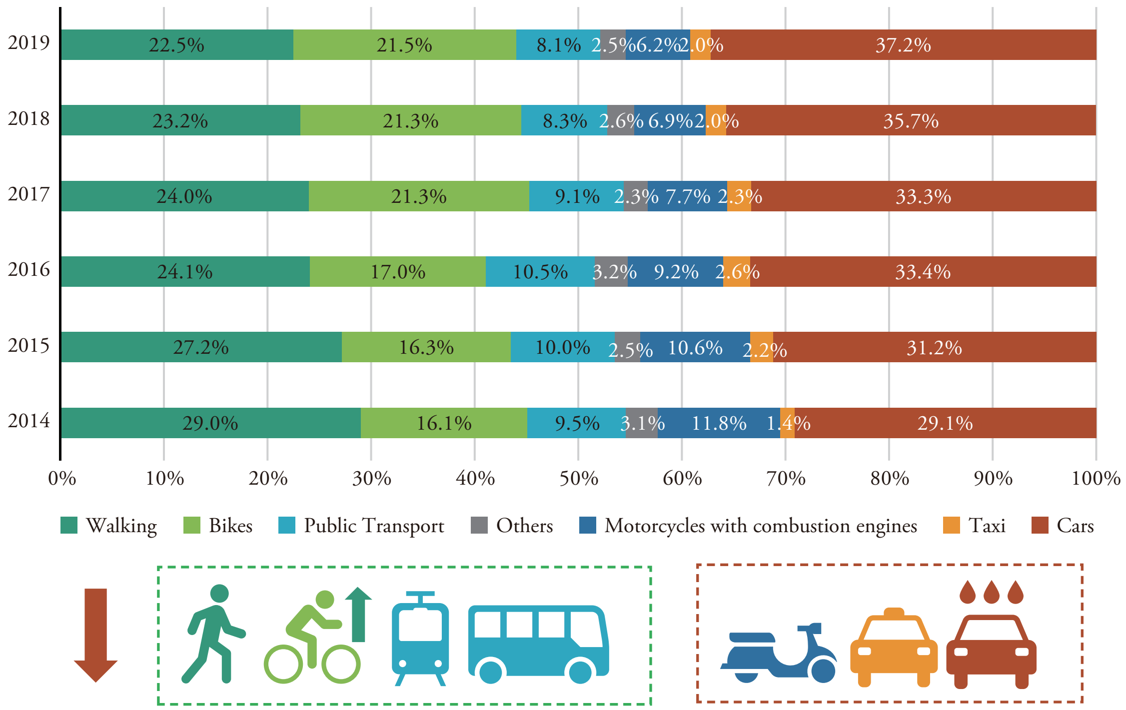
(Source: Foshan Transport Development Annual Report 2019)

[9] Trips less than 10km are deemed as shorter trip, which could shorten the life span of the batteries and engines of cars.

2.3 Key Challenges

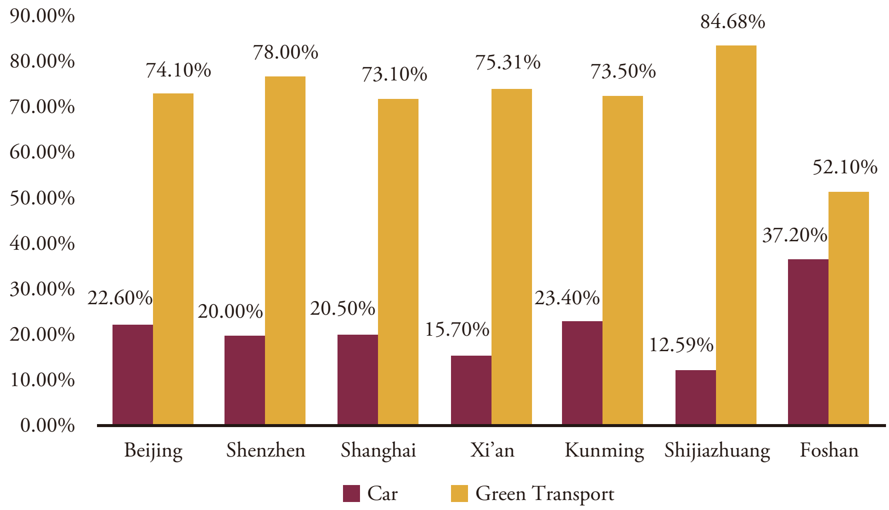
With rapid urbanisation and a growing urban population, the demand for transportation has risen sharply. However, in Foshan, the proportion of car travel has been increasing yearly since 2014 and getting close to 40% by 2019, while the modal share of green transport – walking, cycling, and public transport – is on decline with them accounting for only 52.1% (downtown area) by 2019 (see Figure 2-9), which is a relatively lower level than that of other major cities such as Beijing, Shanghai, Xi'an, and Shijiazhuang (see Figure 2-10). There is a significant gap between the current green transport modal share and the target of 70% (for the downtown area) proposed in the "Foshan Green Mobility Action Plan". The development of sustainable and green urban mobility is therefore at a critical moment.

Figure 2-9 Changes in the Modal Share of All Travel Modes in Foshan from 2014-2019



(Source: Foshan Transport Development Annual Report 2019)

Figure 2-10 Share of Car and Green Mobility Modes (walking, cycling, and public transport) in Major Cities of China in 2019



(Source: Foshan Transport Development Annual Report)

The reasons for the low green mobility modal share are summarised as follows:

Challenge 1: Weak transportation demand management (TDM)

With a car-dominated mobility environment, residents of Foshan have shown a boosted reliance on the use of cars for daily trips, no matter the distance of the journey. Since there is no restriction on the use or purchase of cars, a quarter of people switched from the use of motorcycles to private cars after the motorcycle restriction policy was introduced[10].

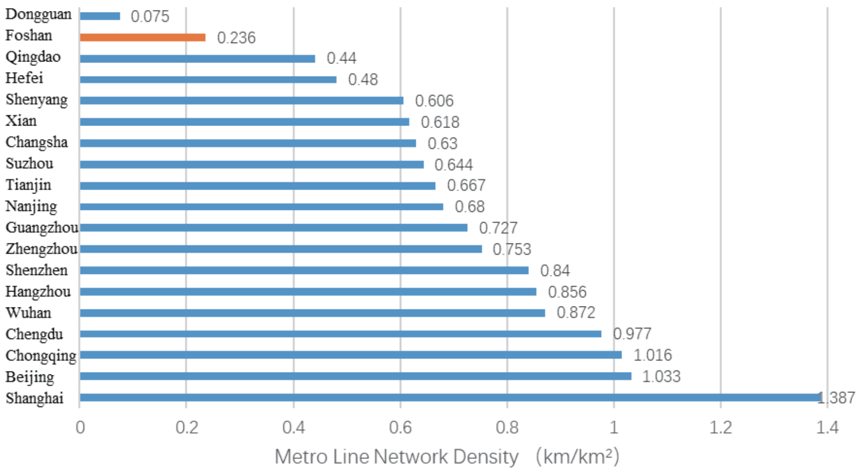
Challenge 2: Insufficient rail supply to meet demand

The development of the rail infrastructure in Foshan is still at its beginning stage, with only two metro lines – the inter-city Metro Line 1 connecting Guangzhou and Foshan (the Guangfo Metro Line) and Metro Line 2 Phase 1 – and two tram lines in operation as of 2021. The total operating mileage of the metro is 54 km, which is much lower than that of adjacent cities such as Guangzhou and Shenzhen. Foshan metro is still in its infancy with a low network density (see Figure 2-11), which could not sustain a high level of social and economic development with an increase in both mobility demands and travel distances.

It is necessary to consider increasing the region's rail service capacity, since a strong demand for this service is seen from the passenger volume of the operating Guangfo Metro Line. The total passenger volume of the Guangfo Metro Line has been escalating from 2010 to 2019 (see Figure 2-12), with a year-on-year increase of 61%, and a line passenger flow intensity that is much higher than the average values in Beijing and Shanghai. Most importantly, the mobility function of the Guangfo Metro Line within each city was significantly strengthened with an increasing percentage of passenger flow volumes within Foshan (see Figure 2-13), which indicated that there was a strong internal demand for metros within the city.

In addition, the questionnaire survey has revealed that speeding up the construction of metro networks was considered to be the most important and urgent task regarding Foshan's future mobility development from the public's perspective, especially in the case of inter-district travel. While this study's survey showed the public's appeal for metro development, some voices highlighted that improvement in internal traffic should be prioritised over the further strengthening of the interlinkages between neighbouring Guangzhou and Foshan (see Figure 2-14). An integrated planning method is therefore required to maintain holistic intercity metro development, but should not be unrolled at the expense of internal metro lines connecting districts within Foshan.

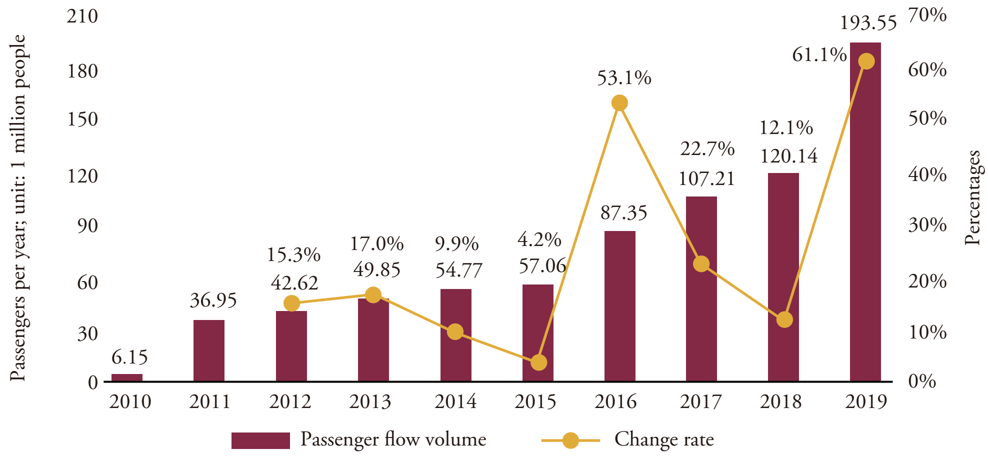
■ **Figure 2-11 Metro Network Density of Major Cities in China**



(Source: Foshan Transport Development Annual Report 2019)

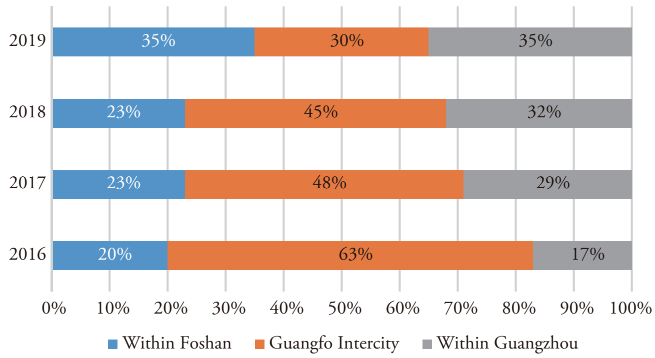
[10] Data derived from Citywide Comprehensive Transport Plan of Foshan, 2017

■ Figure 2-12 Passenger Volume of Guangzhou-Foshan Metro Line from 2010 to 2019



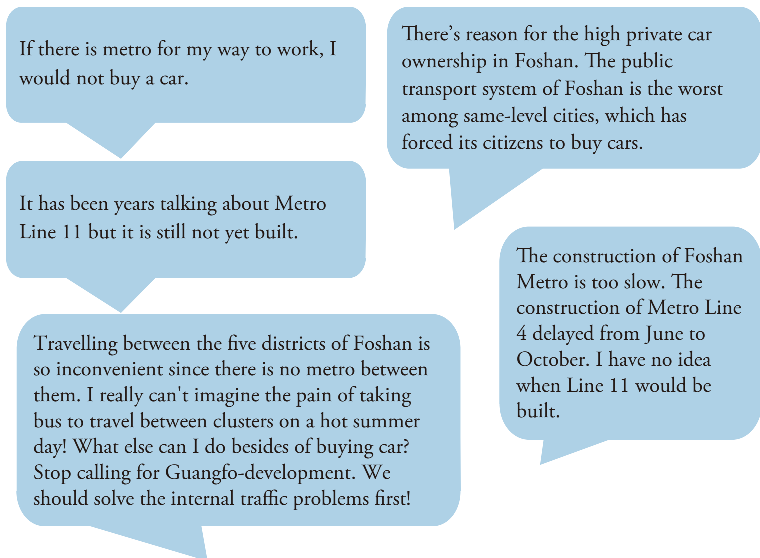
(Source: Foshan Transport Development Annual Report 2019)

■ Figure 2-13 Passenger Flow Distribution Map of Each Section of Guangzhou-Foshan Metro Line



(Source: Foshan Transport Development Annual Report 2019)

■ Figure 2-14 Voices Regarding Metro Development from the Foshan's Public



(Source: from the Questionnaire Survey)

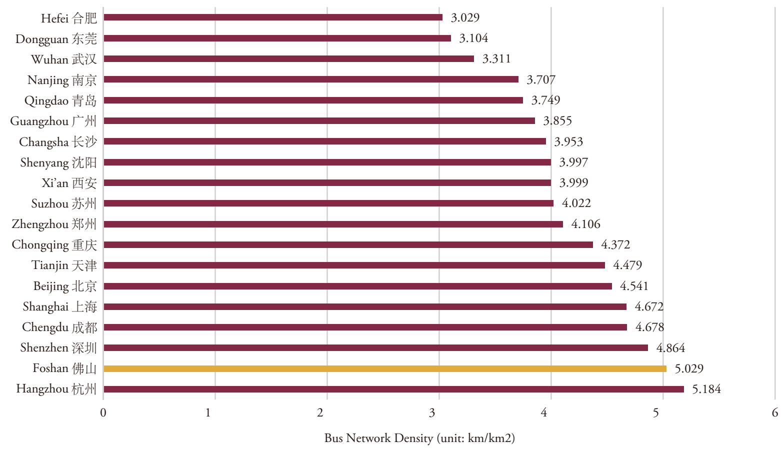
Challenge 3: Bus service supplies not satisfying Foshan's residents

Despite the ever-increasing number of bus routes, bus passenger flows have been declining since 2016, which implies that the supply of bus service is not satisfying the residents. From the questionnaire survey, over one third of interviewees made complaints about long waiting times and a lack of direct lines toward destinations (especially for inter-cluster travel).

The first key problem with bus transit networks was identified as a deficient bus supply. Though the bus network density of Foshan is high and is ranked second amongst major cities in China (see Figure 2-15), the number of buses per million people is lower than the national suggested value.[11] The average number of buses per route is one third than that of Beijing and half than that of Shenzhen. As a result, the intervals between bus runs are too long, leading to extensive waiting times.

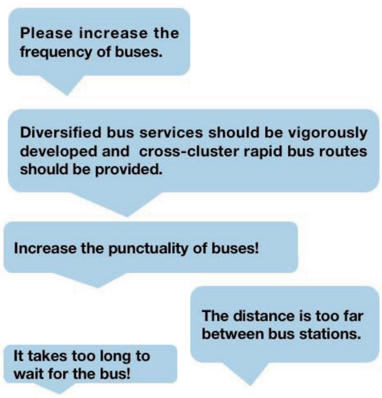
The second identified key problem with bus services is the lack of cross-cluster bus routes due to the lack of integrated planning between the five administrative districts. Moreover, the poor punctuality and long travel time of bus routes were also reasons why the competitiveness of buses compared to the metro, car, motorcycle, and e-bike has been lowered, leading to diminished bus passenger volumes. Declining bus passenger volumes hold the risk of starting a vicious cycle with the subsequent lowering in the overall number of buses running (see Figure 2-16).

■ Figure 2-15 Bus Network Density of Major Cities in China ()



(Source: China Urban Transport Report 2020 - Baidu Map)

■ Figure 2-16 Voices Regarding Bus Service System from the Foshan's Public



In your opinion, which aspects of the bus service system in Foshan need to be improved the most?

Options	Ratio
Large departure intervals and long waiting time	35.03%
Lack of direct routes to destinations	33.80%
Serious route detour	32.01%
Low bus speed; poor punctuality	29.84%
Lack of paratransit routes	24.78%
Insufficient bus stations; far to walk to bus stations	20.78%
Insufficient barrier-free facilities	7.16%
Others	1.30%

(Source: from the Questionnaire Survey)

[11] Fifteen buses per million people is the suggested value in the "Urban Comprehensive Transportation System Planning Standard "

Challenge 4: Disappointing active mobility environment

Being one of the earliest cities in China to implement the concept of sustainable development,[12] Foshan has taken the lead in promoting active mobility. Data from 2014 to 2019 showed that the proportion of cycling trips increased by 5.4% in 5 years (see Figure 2-9). This significant increase is mainly contributed to the great effort of the Foshan government in building and upgrading 1,500 km of cycle lanes, as well as the huge investment made in shared bikes by the overall market. The number of shared bikes per 10,000 people is 526 in Foshan, which is double that of Guangzhou and Shenzhen.

However, though there is an increase in the modal share of cycling, the cycling environment is still unsatisfying. While the booming shared bike industry encourages cycling, it also brings about the shared bike parking issue. Moreover, most current cycle lanes are less than 2.5m wide, which is too narrow to provide a safe cycling environment. Looking at the choice of walking, this modal share has seen a significant drop from 2014 to 2019 (see Figure 2-9) due to an unpleasant walking environment. As reflected in the questionnaire survey (see Figure 2-17), a key problem with active mobility is that illegal parking on streets has dominated the space required for safe and pleasant cycling or walking routes. Furthermore, uneven paving and a lack of continuous cycle lanes make taking bicycles an uncomfortable and inconvenient choice. Additionally, the right-of-way for cyclists is not guaranteed, resulting in mixed traffic on the same pathway and increased safety concerns.

■ **Figure 2-17 Voices Regarding Active Mobility System from the Foshan's Public**

In your opinion, which aspects of the walking environment in Foshan need to be improved the most?

Options	Ratio
Illegal parking on streets has conquered the space for pedestrians	44.19%
Inconvenient to cross street; need to detour	36.50%
Uneven paving	31.10%
Pedestrian pathways are too narrow	26.99%
Unsafe when crossing street	21.94%
Lack of shading facilities on pedestrian pathways	18.57%
Insufficient barrier-free facilities	7.58%
Others	0.95%

In your opinion, which aspects of the cycling environment in Foshan need to be improved the most?

Options	Ratio
Narrow, discontinuous cycle lanes	44.16%
Lack of segregation for bike lanes	40.29%
illegal parking on streets has conquered the space for cycling	33.66%
Lack of shading facilities on cycle lanes	20.39%
Insufficient parking facilities for bicycles	10.32%
Others	1.16%

(Source: from the Questionnaire Survey)

Challenge 5: Lack of integrated transport systems

The two public transport modes, namely the metro and bus networks, are currently in competition with one another instead of having a complementary relationship. Under such circumstances, there is an urgent need to prioritise the demands of Foshan residents, breaking down industry barriers and fostering the integrated development of a seamless transport system.

The survey of this project investigated the problems with interchanges between multi-modes of green transport (walking, cycling, bus, and metro systems) (see Figure 2-18). Firstly, it was determined that an adequate number of information signs for interchanges are missing, and no discounts for transfers are available. Secondly, there are insufficient parking facilities for bikes and e-bikes around metro stations. Thirdly, long distances for transfers take too much time, eventually discouraging people from taking a combination of travel modes.

■ **Figure 2-18 Voices Regarding Public Transit Transfer System from the Foshan's Public**

If you choose to cycle or take a bus to the metro station, which aspects need to be improved the most?

Options	Ratio
Inadequate information sign for interchange	43.21%
Lack of bicycle parking facilities around metro station	40.93%
No discount for transfer	37.21%
Distance is too far for transfer	27.10%
Need to detour due to the huge blocks around metro station	23.73%
Others	1.72%

(Source: from the Questionnaire Survey)

[12] Foshan Daily. Foshan Won the Sustainable Development City Award [N]. (2015-12-31) [2022-6-6]. https://world.huanqiu.com/article/9CaKrnJSN52

3 Future Foshan

Based on the analysis of current mobility conditions in Foshan, a decline in the modal share of green mobility could be seen. This trend is a considerable challenge for the future development of the city if no further policy will be adopted, as depicted in the base scenario for a future Foshan discussed in Section 3.1. The modal share of green mobility can be boosted in three different directions, focusing more on the robust improvement of rail transit supplies, bus system reforms, or fostering a city of short distances. Three alternative scenarios were therefore developed to discuss the possible future steps of Foshan's mobility development. The three alternative scenarios were first quantified through modelling and developed with descriptive characteristics. An evaluation and selection of scenarios was then conducted in the form of an analysis and scoring process during a workshop together with decisionmakers, key stakeholders, and local experts, who debated on the three alternative scenarios, comparing their pros, cons, and overall feasibility levels.

3.1 Base Scenario

The 2035 base scenario illustrated in Figure 3-1 depicts changes already planned up until 2035, as well as any additional foreseeable changes for Foshan City.

In 2035, it is projected that the population size and total employment numbers will keep increasing in Foshan (see Figure 31). As a result, total travel volumes will be approximately 36% higher than they were in 2020. Furthermore, in accordance with urban spatial planning actions lined out in the "Foshan City Land and Space Master Plan (2020-2035)" draft [13], Foshan will form an urban structure with '1 main city centre and 2 city sub-centres' where multiple clusters (Shishan, City Center and Dali central clusters as main city centre; Chencun-Beijiao and Shunde sub-central clusters as city sub-centres) will be located at to strengthen the connection between Foshan and Guangzhou cities. This urban restructuring will lead to a concentration of economic functions and an eventual shift of jobs to the central clusters, which will then increase a jobs-to-housing imbalance with more people working in the city centre while living in peripheral areas. Consequently, the amount of commuting travel between clusters and average travel distances will increase, causing operating speeds on the road to be reduced, due to inefficiencies in road networks. Furthermore, due to additional remaining deficiencies, the public transport network will not be able to provide sufficient public transport services to cover all residential areas. When this context is combined with a rising demand for inter-cluster travel, average travel times will hence increase.

Figure 3-1 Changes in Population, Employment and City-internal Trips

(Source: CSTC)

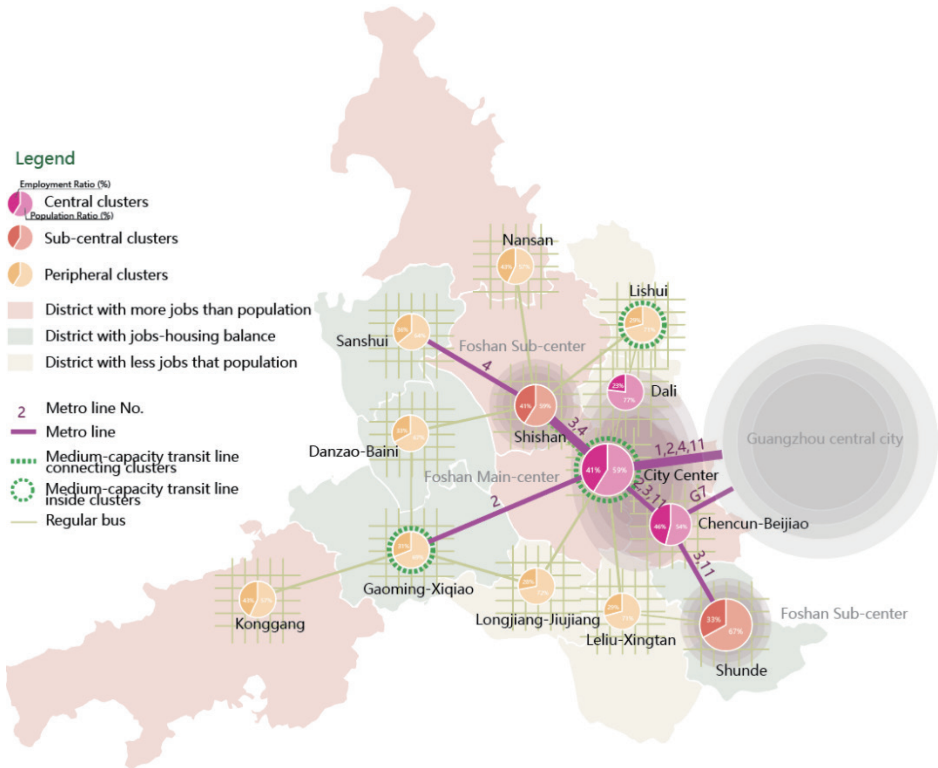
[13] Foshan Natural Resources Bureau. "Foshan City Land and Space Master Plan (2020-2035)" draft publicity [EB/OL](2022-4-29)[2022-6-6]. http://fszrzy.foshan.gov.cn/gkmlpt/content/5/5250/mpost_5250071.html#321

As shown in Figure 3-2 and Table 4-2, in the base scenario, the X-shaped metro network will link not only the linear central areas in a north-south direction but also in a west-east direction. However, no further extension of inter-cluster bus connections is currently being planned. The public transit network will therefore still be sparse and lack connections between peripheral clusters and the city centre. Moreover, bus and metro services will continue to stand against each other in a competitive relationship due to the lack of an integrated planning system.

In the base scenario, no further action will be taken to change the current 'car-oriented' mobility environment. Subsequently, it is expected that car ownership rates and the modal share of cars will escalate on the grounds that no means of control policy will be endorsed. The policy on motorcycle restrictions will be maintained, and this context, together with the driving factor of a lack of public transport services connecting peripheral areas to the city centre, will lead to the reduced proportion of motorcycle users to potentially shift to the use of private cars for both short- and long-distance travel. Increasing car usage will further raise safety concerns for pedestrians and cyclists due to a poor active mobility environment, particularly due to increased rates of cars using roadside parking resources that are not sufficiently managed. The willingness of residents to walk and cycle is therefore at risk to be further diminished.

Under these circumstances, the distribution in modal splits among non-motorised, public transport and private car travel options in the base scenario shows an unsustainable car-dominated mobility trend. Consequently, the modal share of green mobility is expected to further decline to 51%, driven by a drastically increasing reliance on private cars. Over half of all trips will be car-dominated, which will eventually lead to severe congestion, worsened parking problems, and lengthened commuting times. Under this scenario, by 2035, Foshan will become a city with an even higher car dependency than it currently demonstrates, and subsequently will also be subject to higher carbon emission levels, poor air quality and a decrease in the quality of life for residents.

■ Figure 3-2 Concept Map for Base Scenario

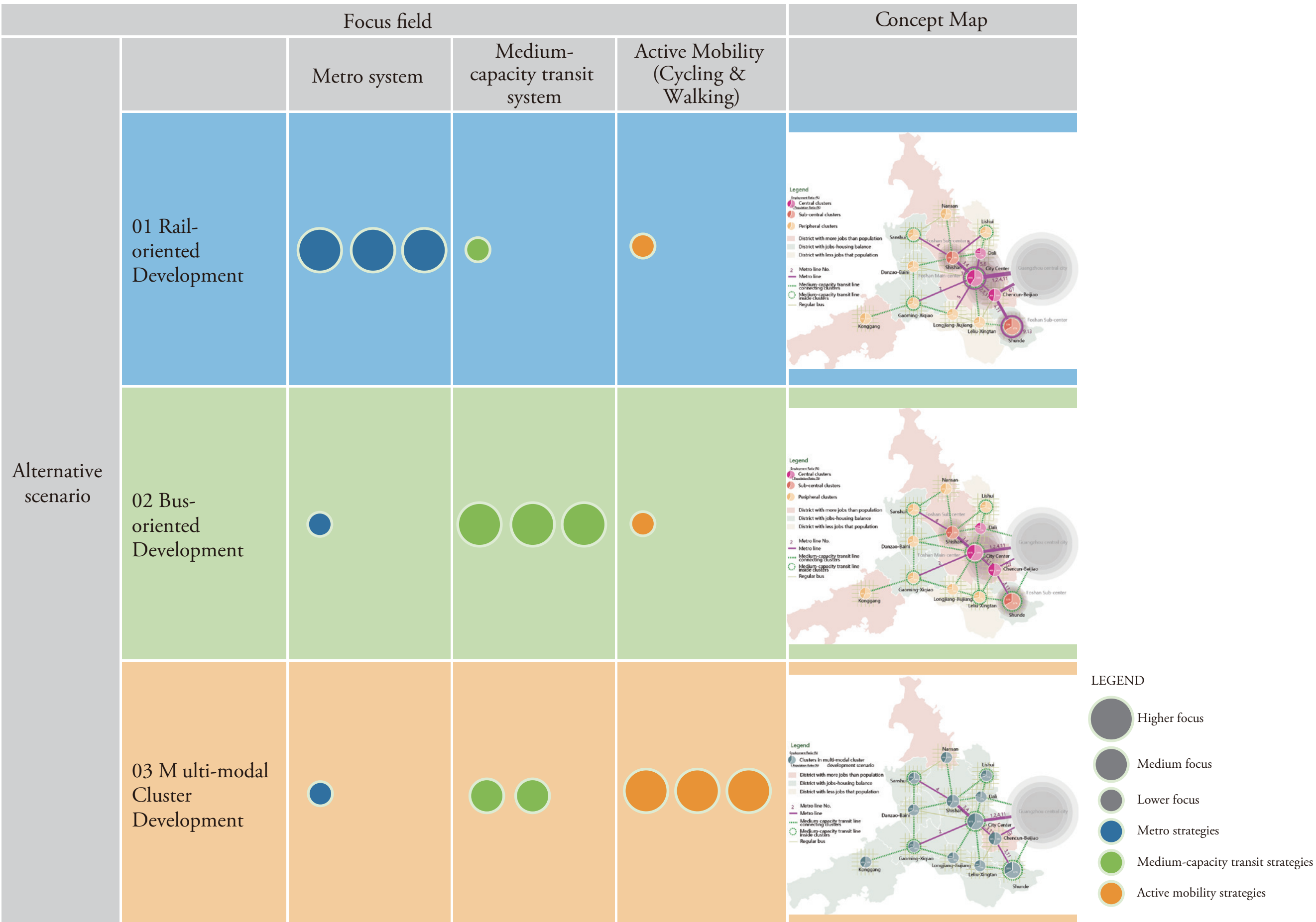


(Source: CSTC)

3.2 Alternative Scenarios

In the base scenario, a decline in the modal share of green mobility could be clearly implied. This trend is a significant challenge for the future development of the city on the grounds that high-quality green mobility should be the key development pathway. Therefore, it is necessary to shift from the use of cars and motorcycles to the use of public transport, walking and cycling. For the sake of this aim, transport demand management must first be implemented to limit the growth of car ownership numbers and restrict the use of cars, hence reducing the modal share of cars and motorcycles. Secondly, the modal share of green mobility can be boosted in three different directions, focusing on the robust improvement of rail transit supply systems, bus system reform, and the fostering of a city of short distances. These varied directions of action are highly related to the overall future development framework and socio-economic development of the city as well as the amount of capital investment that each one requires to be successful. Thus, three alternative scenarios are built with different fields of focus, which make it possible to work through the planning of possible development directions stemming from changes in the priority of different transport policies (see Figure 33).

■ **Figure 3-3 Focus Fields of Alternative Scenarios**



(Source: CSTC)

Alternative Scenario 1: Rail-Oriented Development

In the first suggested scenario, rail systems will serve as the backbone of public transport. The transportation development policy will be more inclined towards the support of rail transit, and provide for a needed construction investment of up to 324.2 billion RMB (equivalent to 47.2 billion EUR, when 1 EUR=6.87 RMB), which is required for the expansion of current rail infrastructure. As outlined in the 2030 Rail Transit Vision Plan in the Comprehensive Transportation Plan of 2017, it is proposed to build and open six additional metro lines when the financial and political conditions are ideal (so far this budget is not yet allocated in plans), including lines 5, 6, 7, 8, 9 and 13. Thus, the total length of the metro network will be 201 km longer than in the base scenario. With a dense rail network and highly accessible rail transit systems implemented in the downtown area, even medium and short-distance travels within the central clusters can be completed by metro. Moreover, the metro network can also connect most clusters to the city centre, meaning that a journey by metro between clusters and the Foshan city centre could be completed within 30 minutes. At the same time, metro axes will also link central areas in Foshan to neighbouring areas in Guangzhou, which would meet the inter-city travel demands induced by the integration of Guangfo City. As the most comfortable, convenient, reliable, and efficient transport tool for all-distance journeys, complemented with car management measures, under this scenario the metro will become the dominating mobility option by 2035.

Alternative Scenario 2: Bus-Oriented Development

A high-quality bus system is suitable for dispersed land use, as is the case in Foshan, where bus networks need to serve a greater rider catchment area with lower capital investment and a shorter construction period. In this scenario, the metro network would remain the same as in the base scenario, but Bus Rapid Transit (BRT) systems will partially take over the backbone role of the metro. A hierarchical bus system with regular buses (using more stops, and having slower travel times) and BRT systems (with less stops, and reaching destinations in a faster time) will fulfil different transport tasks. In the city's central areas, as a supplement to rail transit, regular buses will play the role of connecting lines to feed rail transit systems. Additionally, to meet the inter-cluster travel demands of the rest of the city's areas, BRT lines connecting peripheral clusters will effectively complement the metro axes. Meanwhile, buses will be given a higher right-of way on roads by the setting of exclusive bus lanes and bus-prioritised traffic lights to ensure the efficiency and reliability of bus services. Under the circumstances of this scenario, buses will be the dominating public transport by 2035.

Selected Alternative Scenario: Multimodal Cluster Development

A workshop was organised with local experts, key stakeholders, and decision-makers[14] to select a target scenario from the three alternative scenarios discussed above, by comparing the pros and cons as well as the feasibility of each scenario in the form of a scoring exercise (see Figure 3-4). According to the opinions of stakeholders and decision makers, a substantial increase in the total length of urban rail-transit network would be relatively difficult to achieve due to the tightened criteria for the approval of the new metro lines construction plan from the responsible National Development and Reform Commission (NDRC). Meanwhile, since the distribution of workplaces and settlements depends on the distribution of land-use types in the city, the most suitable future scenario for Foshan was found to be maintaining the existing polycentric urban structure and promoting compact developments within each cluster. A reduction in car use, the improvement of the overall public transport network and the short-distance travel characteristics brought about by supporting a more compact urban structure make alternative Scenario 3 (the Multimodal Cluster Development Scenario) the lowest carbon emission scenario. Eventually, the Multimodal Cluster Development Scenario, with its highest scores in political, economic, technical feasibility, and subsequently having the highest overall number of votes, was selected as the most suitable development direction for Foshan.

[14] Participants of the workshop included representatives of the Foshan Municipal Transportation Bureau (Foshan TB), the Foshan Public Transport Management Company (Foshan TC Company), the Foshan Bureau of Natural Resources, local experts from the Foshan Institute of Urban Planning and Design, as well as representatives of the China Academy of Transportation Sciences (CATS), the Zhundian Public Traffic Institute, and the Shenzhen Urban Transport Planning Center (SUTPC).

As Foshan will form an urban structure with '1 main city centre and 2 city sub-centres', specific attention needs to be paid to strengthening the function of central areas. The excessive promotion of a strong central urban structure could lead to jobs-to-housing spatial mismatch. Therefore, a multi-modal cluster development that focuses more on the even distribution of employment and housing within each cluster in Foshan could be adopted to the current settlement structure, in the selected scenario (see Figure 3-4). Major investment will be put forward to the construction and enhancement of active mobility environments within clusters.

By fostering a short-distance city, most intra-city travel will be completed within clusters, thus the proportion of inter-cluster trips and the per capita travel distance will be reduced compared with the base scenario. Daily travel by residents under this scenario is expected to be completed in about half an hour.

Inter-city and inter-cluster long-distance journeys will be accomplished using the metro lines already planned to be constructed and complementary medium-capacity transit options (for example, city-centre-bound BRT lines). Regarding the metro system, the x-shaped axes and the inter-city connections between Guangzhou and Foshan are planned to be the same as those in the base scenario. At the same time, the development of bus systems will be focused on the demands of inter-cluster corridors which are not covered by metro lines that are already operating, currently being constructed or approved to be built in the future. BRT trunk lines will connect surrounding clusters to the city centre, the western peripheral clusters to each other, and the central clusters to neighbouring areas in Guangzhou (as the complementary line to the Guang-Fo Metro Line). Together with the appropriate layout of new BRT lines, and with the upgrading of existing regular bus lines, the construction cost of expanding metro and medium-capacity transit networks will be reduced, in comparison to other alternative scenarios.

For short to medium-distance journeys, walking and cycling will be the dominating options for travel modes, with continuous, separated pedestrian paths and cycle lanes. The accessibility of active mobility travel options within clusters will be maximised, with a 100% coverage of pedestrian paths and a 95% coverage of cycle lanes expected to be developed. As bicycle networks will be rigorously expanded, bicycle travel times will therefore be sped up.

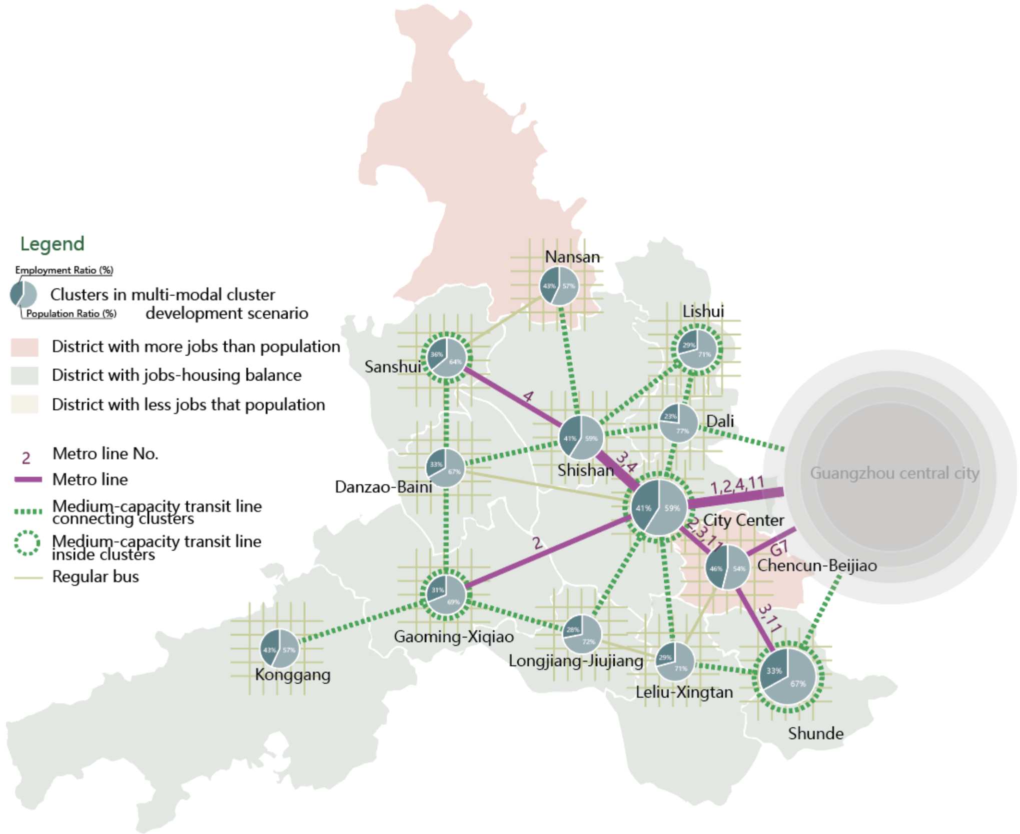
All new roads should be built with segregated cycle lanes, which need to be equipped with a physical separator between cycle lanes and carriage ways, and cycle lanes and pedestrian pavements. On-street parking should be minimised and public spaces should be made available to local populations for their use, fulfilling Foshan's vision of being a 'people-centred' city, namely prioritising people over cars, in the future of its overall mobility development plans. The quality of the active mobility environment will be improved to give better experiences to pedestrians and cyclists, such as through the construction of sheltered pedestrian paths and the greening of streets, to create a context for more enjoyable journeys. Additionally, management measures for e-bikes will be implemented to ensure road safety and solve conflicts between users of different modes of transport.

Under these circumstances, people will be encouraged to walk and cycle instead of using cars for short to medium-distance travels. As a result, the modal share of walking and cycling will potentially reach over 49%. Meanwhile, due to the reduction of car use, the efficiency in transport systems will be improved, and carbon emissions will be only half of those in the base scenario as the modal share of green modes will be higher and the distances travelled will be shorter. Through implementing all of these intended changes, Foshan will become even more of an aesthetically pleasing and liveable city, with a population who can enjoy walking and cycling, as well as living within an environment of low carbon emissions and clear air. Residents living in Foshan will also therefore become healthier.

Figure 3-4 Evaluation Results of Alternative Scenarios

	Fitness to Foshan future development (1-5)	Political feasibility (1-5)	Economic feasibility (1-5)	Technical feasibility (1-5)	Vote count for chosen scenario	Composite score
01 rail-oriented development	2.0	3.8	1.8	2.7	0	2.2
02 bus-oriented development	3.5	3.8	3.3	3.7	1	3.6
03 cluster development	4.3	3.8	4.5	4.0	5	4.2

Figure 3-5 Concept Map for Selected Scenarios



(Source: CSTC)

4 Vision and Objectives

4.1 Vision and Objectives

With its large population, Foshan's economic power even exceeds that of some provincial capitals. The foreseeable growth in Foshan's population and its level of economic development needs a transport system that can organise the movement of people more efficiently, inclusively, and in an environmentally friendly manner in order to prevent further stress on resources, the environment and people's well-being. A sustainable transport system that puts human beings at the centre will ensure smooth and convenient travel – and thus improved health, well-being, and quality of life – for all of Foshan's residents, workers, and visitors, while also reducing the negative impact of transport on climate and the environment. Therefore, this SUMP has put forward a common vision for the development of urban mobility in Foshan according to the features of the selected scenario:

Foshan will be striving for a mobility environment that is green & people-centred by 2035.

To specify the overall vision, five concrete objectives were formulated corresponding to the key challenges identified in the status quo analysis. These objectives reflect the characteristics of a future Foshan presented in the selected scenarios. As a prerequisite, land use planning and urban spatial planning are used to advocate for a city of short distances with a polycentric urban spatial structure, compact urban functions within clusters, and an optimised jobs-to-housing balance.

Objective 1: Increase the accessibility of urban rail-transit

Maximising the utilisation of approved and existing metro lines is a practical pathway to address the public's call for the amplification of urban rail supply networks. Urban railways would strengthen other forms of public transport and create a strong increase in capacity for the whole public transport system. Especially for medium and long-distance travel, a good metro service can significantly improve the attractiveness of public transport systems, hence encouraging a shift from using cars to riding public transit. By fostering the joint development of urban rail transit systems and land use planning, easy access and linkages between residential areas and workplaces to metro stations will be ensured. Subsequently, a substantial increase in passenger volumes due to improved accessibility will boost operational revenue to cover metro construction and operation costs.

Objective 2: Increase the efficiency and flexibility of the bus service system

In view of the mismatch between the supply and demand needs of public transport systems, the existing bus system needs to be optimised. Although urban rail transit serves as the backbone of public transport systems to move people to the city centre, peripheral clusters still need to be interconnected by bus services. Therefore, an upgrade of bus routes is an important approach to improving the overall service quality of the entire public transport system. A promotion of efficiency for the operation of buses also allows passengers to travel directly to their destinations within a shorter travel time. By taking full advantage of the flexibility of the bus line layout and short construction periods, the competitive relationship between bus and metro systems can be transformed into a complementary one.

Objective 3: Encourage seamless mixed-mode travel

When public transport options must increasingly compete with private cars, it is essential to efficiently operate all means of public transport as one seamless, integrated, multimodal system. An integration of the public transport network, schedules, tariffs, and fare payment systems with the provision of easy-to-access trip planning information helps to minimise transfer times within and between metro and bus systems. Furthermore, the convenience and comfort of green mobility journeys could be enhanced by the strengthened coordination of public transport and its feeders, such as last-mile trips by foot or shared bikes. Therefore, measures are required to establish an environment where walking, cycling, and public transport are the natural choices for residents, and where it is easy to change between these transport modes.

Objective 4: Increase the attractiveness of active mobility

Recognising the complaints by citizens on the disappointing environment for active mobility received through the questionnaire survey, the attractiveness of active mobility options must be enhanced. Only by regaining useable and safe spaces for pedestrians and cyclists, most of the journeys within urban clusters could be successfully completed by walking or cycling. This objective is built particularly on the sound basis of the shared bike industry in Foshan and will help to raise the number of bike-sharing users. To build a safe and attractive active mobility environment, the demands and spatial requirements of special groups, such as people with special needs, children and elders, should also be taken into account.

Objective 5: Reduce car-dependency:

Under the current car-dominated mobility environment, more attention should be paid to the management of motor vehicle demands in order to alleviate the carbon emissions derived from road traffic. To support the shift from private cars to green mobility, not only pull factors, such as improving the attractiveness of sustainable transport modes, but also push-factors, such as the regulation of car use, need to be put forward. In regard to the suggested regulation of car use, measures could include the setting of car-free zones, trying to issue congestion charges and an increase in parking fees in the city centre. Guided by the strategy of taking the edge off the convenience of private car use, people will reduce their reliance on cars and be more willing to travel by competitive public transport and active mobility services.

4.2 Overarching Targets

To better monitor the progress made towards the achievement of the objectives, two overarching targets and a set of measurable indicators have been proposed under the two guiding principles of “green” and “people-centred” mobility, as outlined in the SUMP’s vision. The targets, by reflecting the core vision of a mobility environment that is green and people-centred, serve to guide the achievement of the objectives of this SUMP and also, particularly through their subdivision into mode-specific targets, provide a quantitative target by which to measure the progress made towards achieving these objectives.

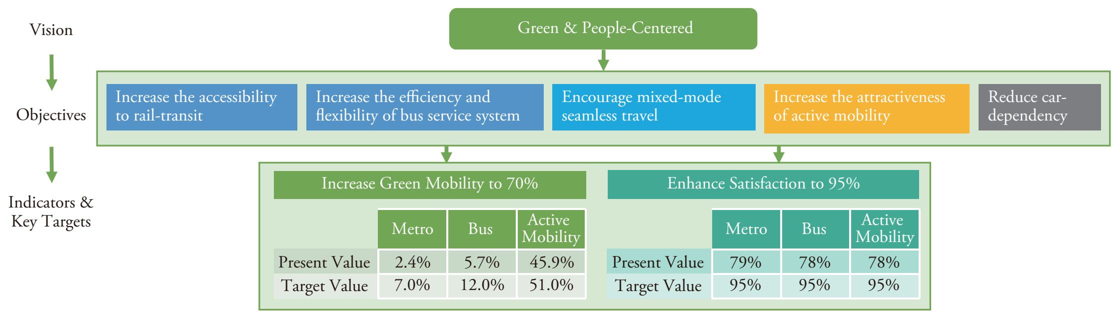
Overarching target 1: Increase modal share of green mobility to 70% (in the downtown area) by 2035

The modal share of green mobility is the total proportion of all trips taken within the city by walking, cycling, and public transport. The modal share of green mobility in Foshan in 2019 was 52.1% (downtown area). It is proposed to increase the modal share of green mobility in Foshan (in the downtown area) to above 70% by 2035. This target is consistent with 3 sub-targets: increasing the modal share of the metro to 7% (in support particularly of Objectives 1 and 3); raising the modal share of bus travel to 12% (supporting mainly Objectives 2 and 3) and boosting active mobility to 51% (to also reach Objectives 3 and 4). By contributing to a reduction in the number of cars and overall demand for car travel in favour of public transport and active mobility, this overarching target and its mode-specific sub-targets also collectively help to reach Objective 5 – reducing car-dependency.

Overarching target 2: Enhance satisfaction rate of travellers to 95% by 2035

People-oriented urban transportation can not only reduce air pollution, and remove safety and health risks, but also can include all groups inclusively and equally, so that urban functions can serve more people. In this way, the satisfaction rate of travellers with metro, bus, and active mobility services is expected to reach 95% by 2035. This target is consistent with 3 sub-targets, achieving a 95% satisfaction rate with the metro (reflecting progress on Objectives 1, 3, and 5), with bus travel (progress on Objectives 2, 3, and 5) and with active mobility (indicating progress on Objectives 4 and 5).

Figure 4-1 Vision, Objectives and Key Targets of the SUMP



(Source: CSTC)

5 Strategic Measures at the City-Level

After reviewing the above-described planning documents,[15] as well as international best practice case studies, a list of measures was drafted to achieve the objectives proposed by this study. By including open questions in citizen surveys and conducting face-to-face interviews with local residents during on-site events, a range of suggestions were received, some of which were further integrated into a list of actions to be pursued, thereby reflecting the core concerns of Foshan's residents in the process of creating the list of measures to be taken. Eventually, measures were created to solve five key challenges identified in Section 2.3 - Key Challenges:

Challenge 1: Weak transportation demand management (TDM)
Challenge 2: Insufficient rail supply to meet demand
Challenge 3: Bus service supplies not satisfying Foshan's residents
Challenge 4: Inconvenient active mobility environment
Challenge 5: Lack of integrated public transport systems

Most importantly, strategic, city-level measures can serve as guiding policy recommendations for the city's future planning while reflecting the SUMP vision and objectives achieved with stakeholders at the city-level. While specific measures for the implementation of the SUMP were developed on a smaller scale at the level of the designated showcase area (see section 6), future strategic, city-level measures are supposed to offer solutions to current problems, and further support the city in achieving the vision and objectives of the overall Foshan SUMP. When selecting strategic measures from a long list of options for action, an evaluation was conducted by utilising a score sheet. Two groups of participants were invited to conduct the evaluation. Twenty-two citizens made up the first group, who evaluated the measures in terms of importance to themselves and their communities. Additionally, fourteen relevant stakeholders, decision makers, and experts were invited to further assess the urgency and feasibility of each measure, while also reflecting on the key demands of citizens already collected through the wider questionnaire survey. Specifically, participants were asked to rate each measure from 1 (meaning very unimportant/non-urgent/unfeasible) to 5 (meaning very important/urgent/feasible) as based on their own opinion. The results were aggregated at the end, where the scores were added up for each measure and ordered from highest to lowest. To summarise, the strategic, city-level measures for sustainable mobility were selected and grouped into five main aspects based on their final scores, with a corresponding ranking (Figure 51):

■ **Strategy 1: Shaping an X-shaped rail transit network connecting the central city areas to the sub-centres and the peripheral areas.**

	City-level Measures	Importance (1-5)	Urgency (1-5)	Feasibility (1-5)	Average	Responsibility
1	Accelerating the rail construction connecting Guangzhou and Foshan	4.2	3.8	2.9	3.4	Foshan Rail Transport Bureau (Foshan Rail TB)
2	Strengthening the land development intensity surrounding the subway	3.8	3.4	2.9	3.2	Foshan Planning and Natural Resources Bureau
3	Eliminating dead-end roads around the subway, densifying surrounding secondary roads	3.4	3.2	3.2	3.3	Foshan Rail TB

(Solving Challenge 2, achieving Objective 1)

[15] The People's Government of Foshan. “14th Five-Year” Plan for Transportation Development in Foshan [J/OL]. (2021-5-6)[2022-6-6]. http://www.foshan.gov.cn/attachment/0/178/178144/4789953.pdf; The People's Government of Foshan. The Citywide Comprehensive Transport Plan of Foshan [J/OL]. (2017-2-21)[2022-6-6]. http://www.foshan.gov.cn/zwgk/zfgb/rmzfbgshj/content/post_1739624.html.

Strategy 2: Building a multi-level bus system with regular buses and BRT that matches corridors with high passenger flow, acts as feeder to the metro network, and increases convenience for the public.

	City-level measures	Importance Score (1-5)	Urgency (1-5)	Feasibility (1-5)	Average	Responsibility
1	Accelerate the promotion of auxiliary public transport and online bus hailing service in Foshan	3.8	3.4	4.1	3.9	Foshan Transport Management Company (Foshan TC)
2	Increase the departure frequency of existing bus lines	3.6	3.2	3.8	3.6	Foshan TC
3	Increase bus lane mileage	3.7	3.3	3.8	3.7	Foshan Transport Bureau (Foshan TB)
4	Increase land allocation for bus stations	3.7	3.2	3.7	3.5	Foshan Planning and Natural Resources Bureau

(Solving Challenge 3, achieving Objective 2)

Strategy 3: Establishing an integrated multimodal public transport system which encourages seamless green mobility.

	City-level measures	Importance (1-5)	Urgency (1-5)	Feasibility (1-5)	Average	Responsibility
1	Strengthening the connection between bus lines and rail stations	4.4	4.5	4.5	4.5	Foshan TC
2	Ensuring there are bus stations within 100m of rail stations	4.1	3.3	4.2	4.0	Foshan TC
3	Optimising the guide signs inside and around bus stations and rail stations	4.0	3.8	4.5	4.2	Foshan TB
4	Improving the quality of bus stations to provide a user-friendly, safe, and pleasant environment for waiting (such as providing shelters, barrier-free waiting facilities, etc.)	4.2	3.7	4.1	4.0	Foshan TB
5	Fare discounts for bus-transfer rail transit and bus-transfer bicycles	4.0	3.4	3.4	3.5	Foshan TC & Foshan Rail TB
6	Speeding up the construction of electronic bus stop signs and promoting the use of smart bus apps which provide real time information of routes and arrival time	3.8	3.1	3.8	3.6	Foshan TC

(Solving Challenge 5, achieving Objective 3)

- **Strategy 4: Optimising active mobility infrastructure and providing a safe, enjoyable, and inclusive environment for active mobility.**

	Measures	Importance (1-5)	Urgency (1-5)	Feasibility (1-5)	Average	Responsibility
1	Improving accessibility by constructing continuous pedestrian walkways and cycle lanes	3.3	3.1	3.1	3.2	Foshan TB
2	Setting up pedestrian and cycle only zones in some areas (such as historical reserves) and prohibiting motorised vehicles	3.7	3.4	4.3	3.9	Foshan TB
3	Removing obstacles on pedestrian pathways and cycle lanes, such as illegal parking, municipal facilities; improving and maintaining the surface quality of pedestrian pathways and cycle lanes	4.2	4.5	4.3	4.3	Foshan Urban Management Bureau
4	Providing sheltered walkways to link public transport stations to "major nodes of activities"	4.1	3.8	3.8	3.9	Foshan TB
5	Greening urban streets to enhance active mobility experience	3.7	3.0	3.6	3.5	Foshan Landscape Bureau
6	Regulating the parking of shared bikes using electronic fences	3.5	4.1	3.5	3.7	Foshan Urban Management Bureau
7	Implementing speed limit measures for motor vehicles on living streets near residential areas	4.0	4.2	4.5	4.3	Foshan TB
8	Introducing "Safe Routes to School"	4.1	4.4	4.4	4.3	Foshan TB
9	Improving road safety and adding surveillance in accident-prone areas	4.0	4.0	3.8	3.9	Foshan TB

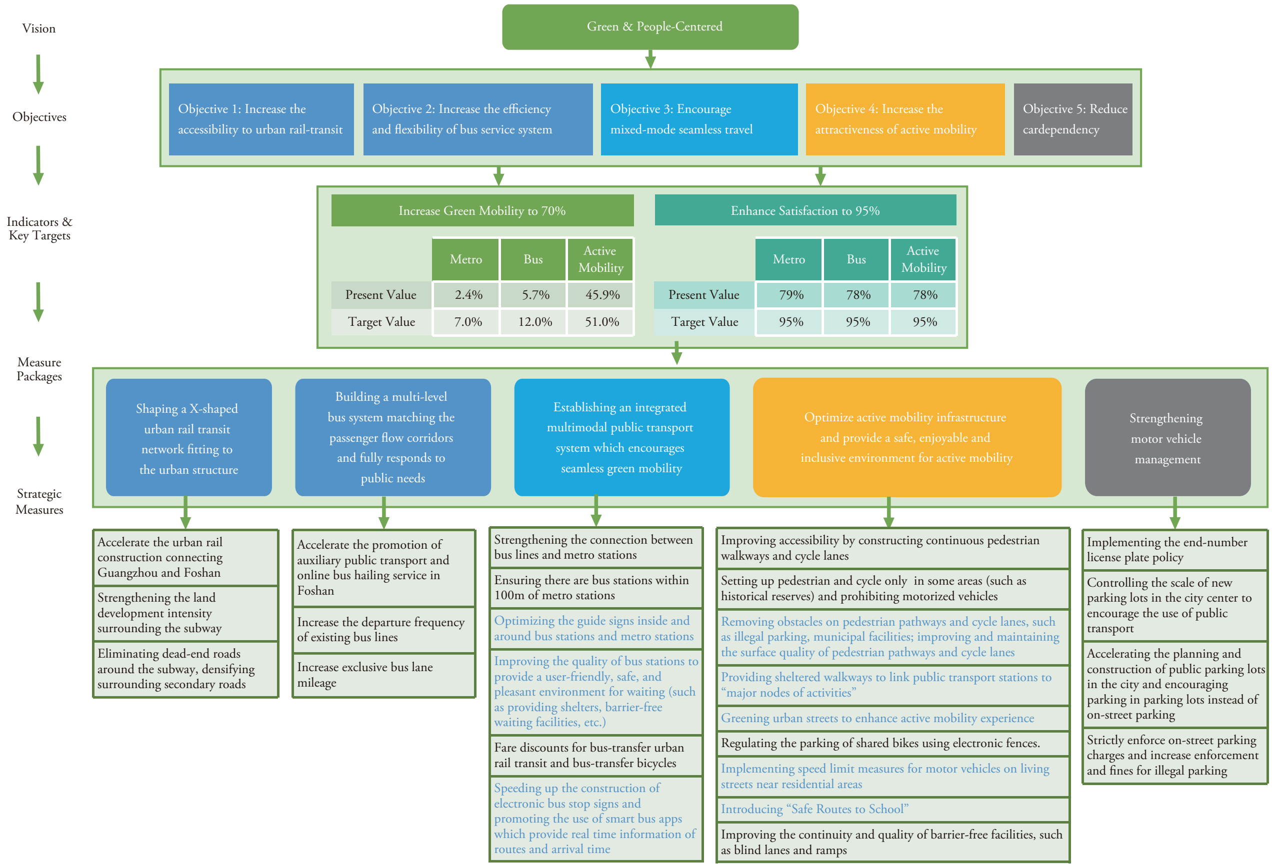
(Solving Challenge 4, achieving Objective 4)

- **Strategy 5: Strengthening motor vehicle management to reduce car dependency.**

	City-level measures	Importance (1-5)	Urgency (1-5)	Feasibility (1-5)	Average	Responsibility
1	Banning motorcycles with combustion engines in downtown	3.2	3.5	4.3	3.8	Foshan TB
2	Implementing the end-number license plate policy	3.4	3.8	3.7	3.6	Foshan TB
3	Controlling the scale of new parking lots in the city centre to encourage the use of public transport	3.5	3.3	3.1	3.2	Foshan Planning and Natural Resources Bureau
4	Accelerating the planning and construction of public parking lots in the city and encouraging parking in parking lots instead of on-street parking	3.4	3.1	3.0	3.1	Foshan TB
5	Strictly enforce on-street parking charges and increase enforcement and fines for illegal parking	4.4	4.1	4.3	4.3	Foshan TB

(Solving Challenge 1, achieving Objective 5)

■ Figure 5-1 Measures Corresponding to Five Objectives



(Source: CSTC)

6 SUMP Application in the Showcase Area

6.1 Showcase area introduction

The development of specific measures as a demonstration of the SUMP in a showcase area was proposed by the Foshan Transportation Bureau (Foshan TB) to visualise the key concepts of SUMP, such as developing a people-centred and sustainable transport system, and to get the support for the proposed measures from citizens and decision makers. Kuiqi Rd. station area, located in the Chancheng District, was selected as the showcase area by the Foshan TB as: 1) Its identity as a transit community[16] draws wider nationwide attention; 2) Its central location in the city and its diverse built environments guarantee its visibility as a pilot site; 3) It has the vital transfer station, Kuiqi Rd. Station in the centre, and; 4) It has a mix of residential and commercial areas, with last-mile travel underserved by public transport. The showcase area was 1.8 km long and 1.4 km wide, covering 2.5 square kilometres.

■ **Figure 6-1 Showcase Area Location**

(Source: CSTC)

6.2 Main mobility challenges in the showcase area

Key mobility challenges in the showcase area were identified through site visits and workshops with local planning institutes. Most importantly, clear links were identified between the challenges faced in Foshan as a whole and challenges identified in the showcase area.

1) Unclear rights-of-way for pedestrians and cyclists

According to the questionnaire survey, 'narrow, discontinuous bike lanes' and a 'lack of segregation for bike lanes' were the main aspects that made citizens feel unsatisfied in general with the active mobility environment in Foshan. In the showcase area, most streets have pavements (sidewalks), but some lack designated bike lanes. This means that cyclists are forced to either ride on the pavement (see Figure 6-2) or in vehicle lanes. On those streets that have both pavements and bike lanes, the rights-of-way for pedestrians and cyclists are unclear. For those bike lanes located on pavements there is no physical separator in-between areas for cyclists and pedestrians. These shortcomings bring safety risks and decrease the comfortability of active mobility choices, which aligns with the citywide mobility challenge '(4) Disappointing active mobility environment'.

■ **Figure 6-2 Electric Bikes and Pedestrians on the Same Road Section**

(Source: CSTC)

[16] In 2020, the Foshan government published the Announcement of Competitive Consultation on Planning and Implementation Strategies and Example Studies of Public Transport Communities in Foshan City（《佛山市公交社区规划与实施策略及示例研究竞争性磋商公告》）to recruit consultants for planning three exemplary transit communities, and the showcase area is one of them.

2) Unfriendly travel environment for children and the elderly

Children, the elderly, and other people with special needs are vulnerable groups and need special attention in active mobility planning. According to citizens' opinions from the questionnaire survey, the lack of a barrier-free active mobility environment has caused inconvenience to the elderly, disabled groups, and people using wheeled vehicles for mobility. Similar to the citywide challenges, in the showcase area, the lack of active mobility facilities and space occupied by bikes and e-bikes is also hindering children and their parents from using sustainable transport modes, such as bicycles or walking, for instance to make their way to school (see Figure 6-3). Similarly, the elderly or other mobility impaired citizens are experiencing difficulties walking around in the same geographic areas. Elder-friendly facilities, such as armrests and ramps to walk safely, and benches to rest are rarely available on sidewalks. Unsafe and inconvenient travel experiences can discourage elderly and other mobility impaired citizens to take trips and thus their mobility is constrained.

■ Figure 6-3 School Front Area Lacking Active Mobility Facilities

(Source: CSTC)

3) Lack of metro connection services within the block

In Foshan, the two public transport modes, namely metro and bus systems, are currently in competition with one another instead of having a complementary relationship. Under such circumstances, there is an urgent need to prioritise the demands of Foshan residents, breaking down industry barriers, and fostering the integrated development of a seamless transport system.

In the showcase area, there are trunk and regular bus lines connecting to the metro station, but these are mostly laid along the main road, and act as block boundaries. Although the bus services can cover the entrances and exits of most residential and commercial plots, residents need to walk to the main road to access bus lines. Two bus lines can connect to the metro station, as shown in Figure 6-4. Because the line extends outside of the area, the total length of the line is relatively long, and the service is positioned for medium and long-distance travel. The existing regular bus stops almost cover the whole showcase area (see Table 6-1). From any point in the area, citizens can reach a regular bus stop within a 300m walk. However, there are few bus stops inside the blocks with a low inner-block rate of 17% (among a total of 47 regular bus stops, only 8 stops are inside the blocks). Additionally, microcirculation options to the metro station are also missing.

■ Figure 6-4 Existing Metro Connecting Bus Lines with Inner-Block Service Gap

(Source: CSTC)

■ Table 6-1 Bus Service Coverage

	Bus service coverage within 300m
Residential Land	92%
Commercial Land	96%
Educational Land	93%

6.3 Measures selected for the showcase area

To address the abovementioned mobility challenges, measures were selected from the city-level measure package and customised to suit the conditions of the showcase area. A showcase area workshop was conducted involving both stakeholders from the district and the showcase area to select actions while validating the contribution of selected measures to achieve the vision and objectives previously developed at the city level.

In selecting the measures of action for the showcase area, two criteria were applied. First, it was determined if support for the measure was given by the public and experts, as reflected by public opinions gathered through the questionnaire survey and the scores of individual measures given by local experts during stakeholder workshops. Second, the implementation feasibility of the measure was examined. Feasible measures were determined to be those with an appropriate implementation scope and that are in line with the local government's action plans.

Under these criteria, three comprehensive measures were selected for the showcase area: (1) Creating safe routes to school; (2) Bike lane upgrading, and; (3) Microcirculation bus lines.

6.3.1 Safe routes to school

"Routes to school" cover public spaces and streets that connect schools to residential areas, public transport stations and important community venues frequently used by students and their custodians. Well-designed routes to school provide a safe, comfortable, and attractive commuting experience for students[17].

There are several space and facility elements that greatly influence students' safety and commuting experiences, which should be taken into consideration in designing safe routes to school. They are outlined in Table 6-2.

The project team selected Huijing Elementary School (HES) as an example to demonstrate the current challenges of commuting to school faced by local students. Challenges were identified through a site survey and included: 1) A lack of dedicated pick-up-and-drop-off zones near school gates (see Figure 6-5); 2) A lack of public space (see Figure 6-5); 3) Missing bike lanes, and; 4) Narrow and bumpy pavements (see Figure 6-6).

To address these challenges, measures were proposed under the umbrella of "green" and "people-centred" themes, and were selected specifically to ensure a "safe, pleasant, and attractive" commuting experience for students. They also took into account the key space and facility elements mentioned in the beginning of this section (see Table 6-1).

■ **Table 6-2 Safe Routes to School – Space and Facilities**

Space	Function	Desired quality	Facility
School front gate areas	Space for parents gathering and waiting, temporary passenger loading, temporary parking; traffic buffer zone	Open, spacious, organised	Seats with coverage above, car bollards, info. boards, drop-off-and-pick-up space, bike parking facilities, school bus loading zone and vehicle loading zone
Streets near school	Transportation, space for playing	Safe, continuous, interesting, high-quality attractive	Traffic signs and signals, bike lane, pavements, street furniture
Intersections	Transportation	Safe, organised, attractive	Markings, traffic sighs and signals, waiting zone

[17] Shenzhen Children-friendly Transportation System Construction Guidelines (Pilot) (《深圳市儿童友好出行系统建设指引（试行）》)

1) Safe

First, implement a series of design elements on the intersections of civil roads near schools. These elements can include school zone road signs, speed-limit signages, speed humps that slow down vehicles, and crosswalk paintings (see Figure 6-7). Second, provide dedicated pick-up-and-drop-off zones for cars and non-motorised vehicles. The maximum parking time for cars should be 5 minutes.

2) Comfortable

Bike lanes should be provided for a convenient and comfortable active commuting experience. Street furniture, including seating, canopies, sculptures, and information boards in applicable spaces could be added, and waiting zones for parents could additionally be provided (see Figure 69).

3) Attractive

Interesting and attractive pavements and signs can be added to encourage children to walk or bicycle to school (see Figure 6-10). Additionally, adding attractive play facilities in large open spaces would provide opportunities for learning and for physical activities for children (see Figure 6-11). Events can also be organized to encourage active commuting meanwhile strengthening students' safety awareness levels. Such events could include "walking bus" drills and traffic police lectures (see Figures 6-12 and 6-13).

■ **Figure 6-5 Dedicated Pick-Up and Drop-Off Zones and Public Space Absent from the School Gate Area**

(Source: CSTC)

■ **Figure 6-6 Narrow Sidewalks near HES**

(Source: CSTC)

■ **Figure 6-7 Speed Hump**

(Source: NACTO[18])

■ **Figure 6-8 Crosswalk Paintings**

(Source: https://street-plans.com/greenbelt-alliance-demonstration-projects-san-jose-ca/)

■ **Figure 6-9 Proposed Bike Lanes and Street Furniture**

(Source: CSTC)

[18] https://nacto.org/publication/urban-street-design-guide/street-design-elements/vertical-speed-control-elements/speed-hump/

■ **Figure 6-10 Play Facilities**

(Source: CSTC)

■ **Figure 6-11 Playful Pavement**

(Source: Kim Hairston, Baltimore Sun[19])

■ **Figure 6-12 Walking Bus, Borehamwood, England**

(Source: Parkside Community Primary School[20])

6.3.2 Bike lane upgrading

1) Overall strategies

To develop bike lane upgrading measures, the project team first identified the main cycling corridors in the showcase area and then conducted a site survey to identify the key challenges to cycling on those roads. 14 roads were identified as main corridors for bike transport. In consideration of road types, space availability, and current rights-of-way allocation, renovation strategies were proposed and categorised into six types. These six types of renovation options, outlined in Figure 6-14, include:

- **Narrowing car lane width,** to be applied to streets where the space for cycling and walking is insufficient and the car lane width is far above the minimal requirement.
- **New road construction,** to be applied to neighbourhood streets located in "urban villages"[21] that lack pavements and bike lanes.
- **Minor design improvement** (no change of car lanes), for streets that have fair infrastructure but still pose challenges to cycling and walking due to limited bike lane width or negative space uses, such as parking.
- **No change.** This applies to streets that are already bike-friendly in terms of cycling space and infrastructure quality.
- **Converting to mixed street,** to be applied to neighbourhood streets that have low traffic volumes and where the space for separate bike lanes remains limited.
- **Reduction in lanes,** applying to streets where spaces for bicycling and walking are not enough and the traffic volume could be supported by a smaller number of vehicle lanes.

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[19] https://www.baltimoresun.com/education/bs-md-ci-city-charter-success-20200115-mbbelzovfrhkxp7ugjjkp27dta-story.html
[20] https://parkside.herts.sch.uk/walking-bus/
[21] Urban villages (chengzhongcun) appeared in many Chinese cities as a result of China's rapid urbanisation. They are densely populated areas lined with narrow streets, typically low-quality housing and a variety of shops and services. As affordable areas, they are commonly inhabited by poor residents and urban migrants, but, viewed as products of undesirable planning or a lack of governance, they are often overcrowded and associated with social problems. They also share characteristics of deliberate urban village designs, such as pedestrianisation, self-containment, or interactive neighbourhoods, and have been the subject of redevelopment processes in China in recent years. See Yuan et al., 2022, "An Analysis of Transaction Costs Involved in the Urban Village Redevelopment Process in China," https://www.mdpi.com/2075-5309/12/5/692.

2) Roads selected for implementation of actions in the near future

Four roads (Lanshi 1st Road, Huayuan East Road, Jinlan South Road, and Lujing Road) have been included in the city's most recent infrastructure upgrading plan. In line with the city's plan, conceptual design schemes for the four roads were developed.

- **Lanshi 1st Road**

Lanshi 1st Road is a six-lane major road with delineated bike lanes. However, the existing lanes are only marked by a white line instead of being painted or equipped with physical separators. On-street parking takes up most of the cycling space, and cyclists are forced to ride close to vehicle flows. Furthermore, it is dangerous for cyclists to ride along parked cars due to the risk of unexpected door-openings (see Figure 6-14).

■ **Figure 6-14 Six Types of Improvement Strategies for Main Transport Corridors**

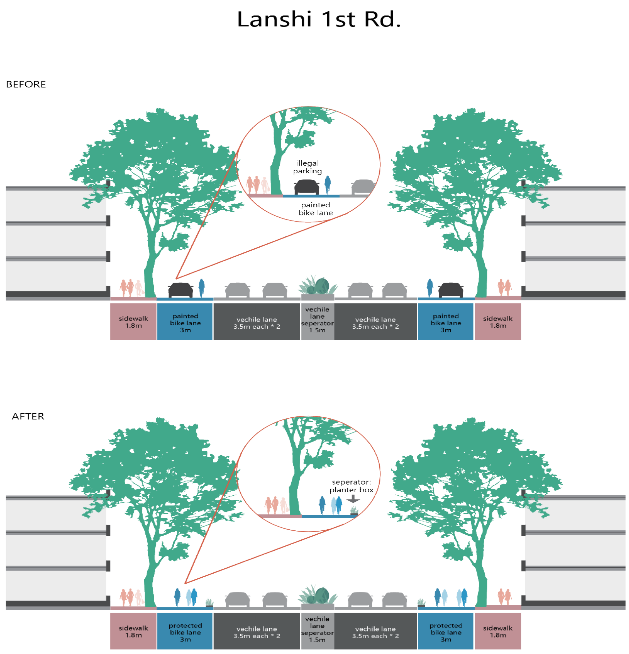
(Source: CSTC)

■ **Figure 6-15 Bike Lane Marked With a White Lane and Blocked by Parked Vehicles**

(Source: CSTC)

Key measures planned for Lanshi 1st Road include: 1) Removing on-street parking; 2) Adding physical separators between bike and car lanes (including in the form of planter boxes, which are is recommended as the width of the bike lane is sufficient) and; 3) Adding bike- lane paint (in green, in consistency with painted bike lanes on other roads in the showcase area – see Figure 6-15).

■ Figure 6-16 Before-and-After Street Section, Lanshi 1st Rd.



(Source: CSTC)

- **Huayuan East Road**

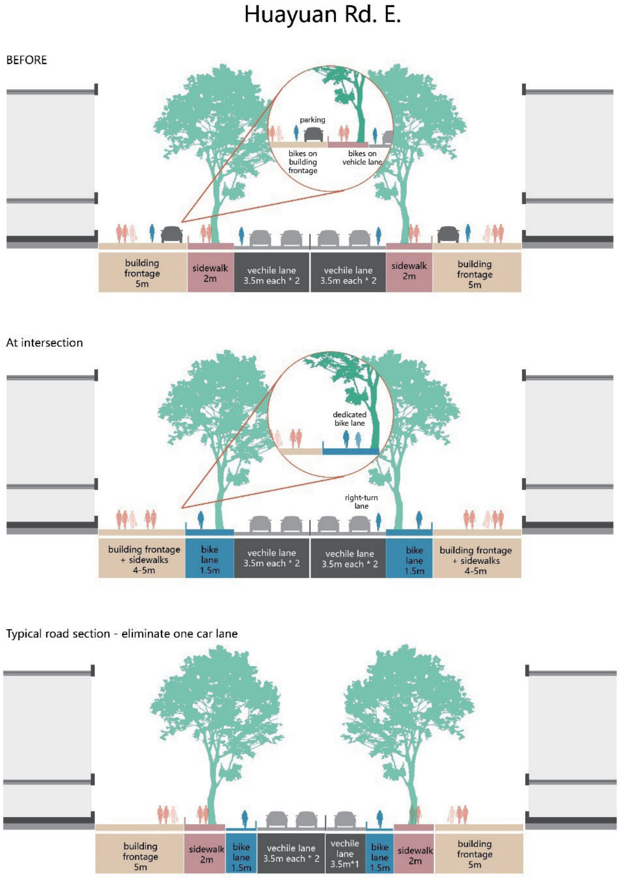
Huayuan East Road is a four-lane secondary road. No bike lane was visible at the time of the site survey in Autumn 2021 (see Figure 6-17). Instead of having a dedicated lane, cyclists were forced to ride in vehicle lanes or on the building frontage. Pavements were about 2m wide. The traffic volume on northbound lanes was seen to be relatively low, and building frontages on both sides were mostly taken up by parking.

■ Figure 6-17 Lack of Bike Lanes

(Source: CSTC)

An important strategy planned for this location is to eliminate parking on the building frontage and repurpose the space for pavements and public uses, which would also free up the space of the previous pavements for bike lane purposes. Other purposes for this area could include adding traffic signals or bike parking facilities. On a typical road section, another proposed strategy is to cut off one northbound car lane where the traffic volume is currently low, and construct 1.5m bike lanes on both sides of the streets. At intersections, four vehicle lanes would be required for right-turning. Therefore, bike lanes would be added in these locations on the pavements. Physical separators therefore are suggested to be added for clear designation of the rights-of-way for both pedestrians and cyclists (see Figure 6-18).

■ Figure 6-18 Before-and-After Street Section, Huayuan East Road



(Source: CSTC)

- **Jinlan Road**

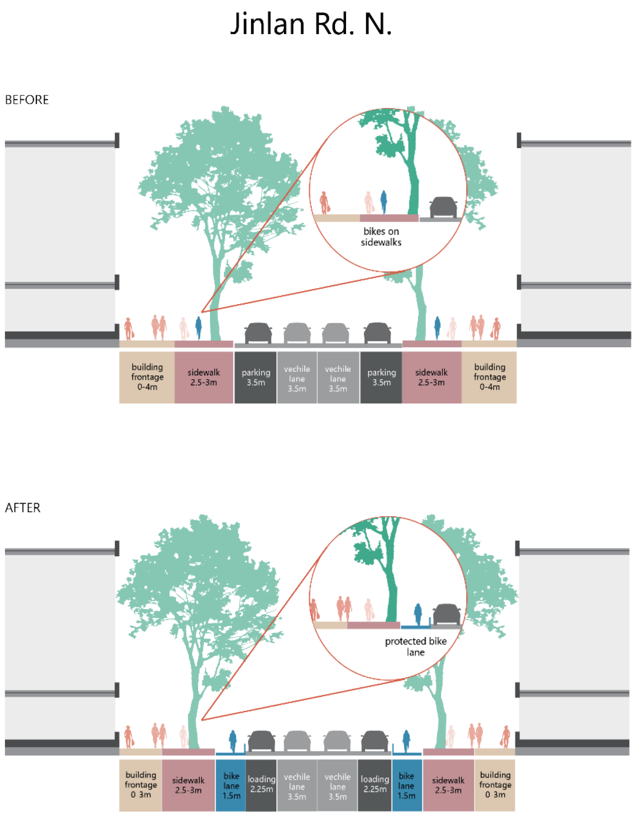
Jinlan Road is a four-lane secondary road without dedicated bike lanes. On most of the road segments, on-street parking takes up the two side lanes, meaning that the traffic volume could be supported by a smaller number of car lanes. Cyclists were found to either be riding in vehicle lanes or on pavements (see Figure 6-19).

■ Figure 6-19 Lack of Bike Lanes and a Cyclist Riding on Sidewalks

(Source: CSTC)

The main strategies proposed for the improvement of cycling environments on Jinlan Road included: 1) Reducing the side-lane width from 3.5m to 2.25m and repurposing side-lanes as temporary loading zones instead of as parking spots; 2) Reducing the width of the building frontage which was currently occupied by parking, and; 3) Using space freed up by Strategy 1 and 2, constructing a 1.5m bike lane on each side of the road, with slim physical separators to protect cyclists (see Figure 6-20).

Figure 6-20 Before-and-After Street Section, Jinlan North Road



(Source: CSTC)

- **Lujing 1st Road**

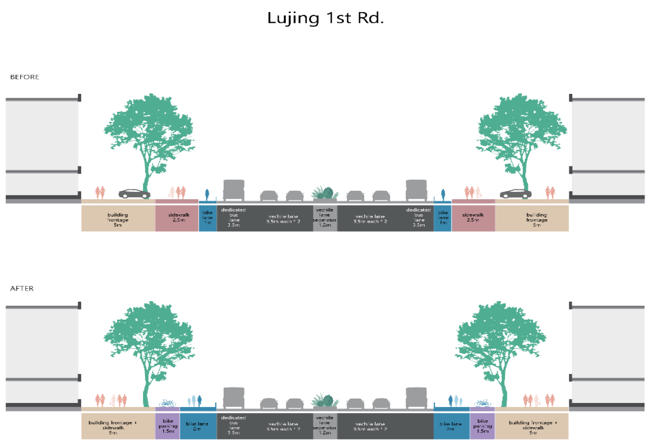
Lujing 1st Road is a six-lane main road, with painted and (partly) protected bike lanes. However, bike lane width is limited (being currently around 1m, as seen Figure 6-21). In contrast, space on the building frontage is extensively available, though currently occupied by parking.

Figure 6-21 Narrow Bike Lane and Missing Physical Separators on Some Road Sections

(Source: CSTC)

Key measures to be taken for the improvement of Lujing 1st Rd. include: 1) Eliminating parking on building frontages and repurposing the space for pavements and street furniture; 2) Expanding the bike lane width from 1m to 2m and providing 1.5m-wide bike parking zones on the original pavements, and; 3) Providing physical separators where they are currently missing. Figure 6-22 shows a before-and-after illustration for a typical road section of Lujing 1st Rd.

Figure 6-22 Before-and-After Street Section, Lujing 1st Rd.



(Source: CSTC)

6.3.3 Microcirculation Bus Lines

1) Objectives and Strategies

To achieve the holistic vision of a mobility environment that is green and people-centred, the objective specifically set for microcirculation bus lines is to achieve convenience, accessibility, and comfort when using public transport.

Correspondingly, five strategies are proposed based on the objective:

- Utilise the collector roads and local streets to provide access into residential blocks
- Identify mobility demand hotspots in residential, social, and commercial areas and directly connect them to with entrances to the Kuiqi Road metro station at the centre of the showcase area
- Shorten the total length of operated bus lines to improve the efficiency
- Customise bus services to cater to diversified needs to encourage citizens to take public transport
- Accurately identify target customers and their needs to improve bus travel satisfaction

2) Best Practices

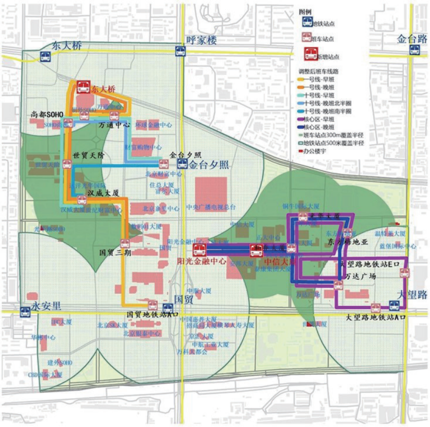
Based on the best practices of metro feeder bus services in China (see Table 62), the following adaptations to the planning of microcirculation bus lines in the showcase area are suggested:

- Precise functional positioning: short-distance (1-3km) internal microcirculation buses
- Few stops: 4-6 stops, which can be aligned with existing bus stops in the area
- Short dispatch headways: 3-8 minutes
- Bus type: Minibus, electric
- Small fleet: 4-7 vehicles
- Flexible service hours: the operating hours and routes can be adjusted according to demand

Table 6-3 Best Practices of Metro Feeder Bus Services in Beijing

Name	(1) Beijing CBD Free Business Shuttle Bus (see Figure 6-23)	(2) Beijing Zhong Guan Cun Science Park (Z-Park) Commuting Bus (see Figure 6-24)	(3) Beijing Wangjing Cruise Minibus (see Figure 6-25)
Functional positioning	Short-distance internal microcirculation metro feeder bus serving metro commuters	Connect Z-Park to the metro station, micro-circulation bus line	Short-distance connection between metro stations and office buildings
Operating Length	1-3km, different routes at different time	8.3km, one-way circular line	Fixed station with flexible route
Nr. of Stops	4-6	12	Based on existing bus stops
Service Hours	7:30-9:30 17:30-19:30, on weekdays	7:30-10:30, 16:00-19:30 on weekdays	7:30-11:00, 17:30-20:30 on weekdays
Dispatch Headway	3-8 min		On-demand
Fleet	16 vehicles		14-seat minibus, electric
Notes	Operating cost 14,200 RMB/month/vehicle, fully subsidised by the government	Ticket price 2 RMB	Algorithms automatically match orders along the way to maximise vehicle utilisation.

■ **Figure 6-23 Beijing CBD Free Business Shuttle Bus Route Map**



(Source: CSTC)

■ **Figure 6-24 Beijing Zhong Guan Cun Science Park (Z-Park) Commuting Bus Route Map**

(Source: Tencent Map)

■ **Figure 6-25 Beijing Wangjing Cruise Minibus**

(Source: Gongjiaomi[22])

3) Planning Proposal

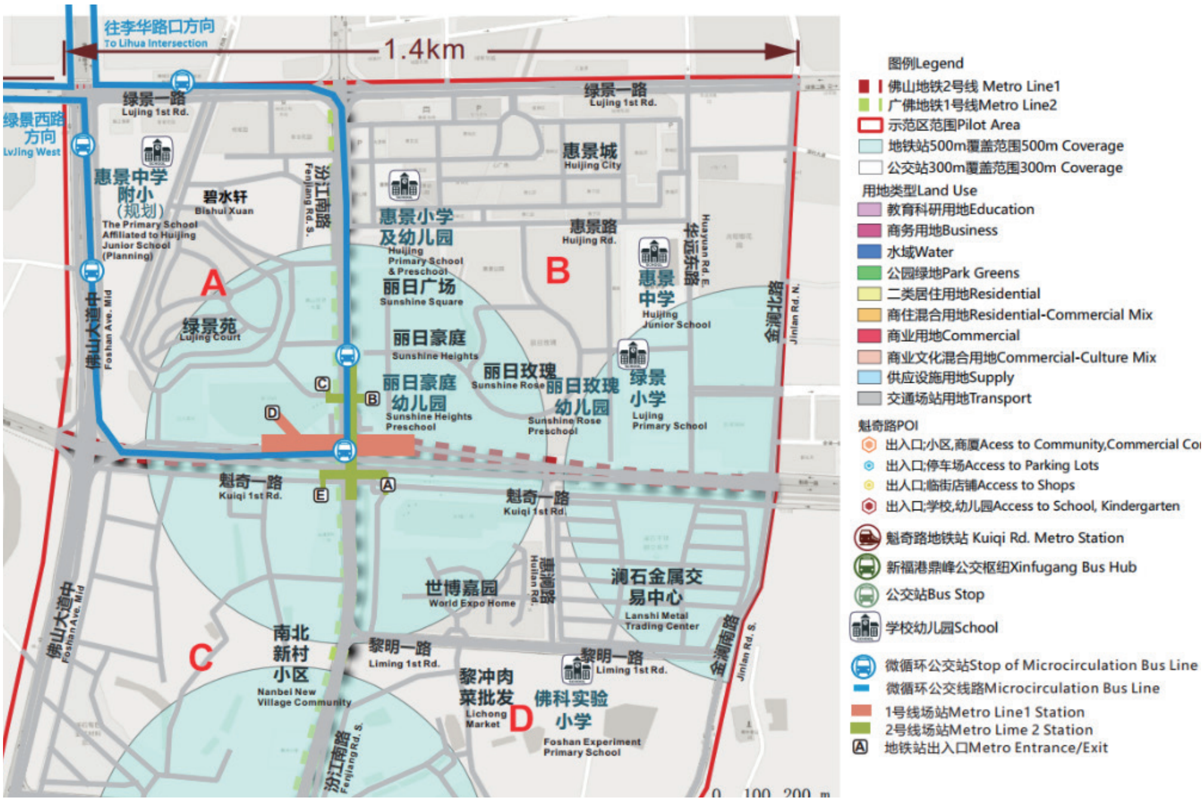
The planning proposal of the microcirculation bus lines for the showcase area was drafted in consideration of the planning objectives and characteristics of best practice cases, including considerations of route layouts, the location of stops, and operation schemes.

It is recommended to set up microcirculation bus lines in Block A to take passengers to the metro station (see Figure 6-26 and Table 6-3). The drafted route could be first tested in a trial operation, to enable the adjustment and optimisation of the bus line layout according to the passenger counts at each stop.

- **Route:** A clockwise, one-way circulation with a total length of 6.8km, that avoids driving on the congested section of the arterial road.
- **Operation:** The operation period is to be during the morning and evening peak hours (7:00-9:00; 17:00-19:00). As calculated at an operating speed of 10-13km/h, a whole one-way trip would take 28 minutes. Equipped with a fleet of five vehicles, a departure interval of 6 minutes can be guaranteed during the peak periods.
- **Vehicles:** 8-meters minibuses, easy to drive through narrow roads, that are electric and low-carbon.
- **Stops:** There is a total of 12 stops along the line, including 3 newly built request stops (at which buses stop only upon request). The average distance between stops is relatively short, which can effectively increase the convenience of accessing a bus stop. To minimise walking distances and realise a "door-to-door" connection to the metro service, almost all microcirculation bus stops are located at the entrances and exits of the community and in front of the school gate. In addition, the terminal stop is set at the existing bus hub to ensure bus dispatch and deployment.

[22] http://www.gongjiaomi.com/thread-1247442-1-1.htm

Figure 6-26 Microcirculation Bus Line Proposal



(Source: CSTC)

Table 6-4 Microcirculation Bus Line Scheme

Line	Service Zone	Purpose	Length(km)	One-way running time(min)	Stops	Dispatch Headway(min)
Micro-bus	A	Connecting schools and residential communities with the Kuiqi Road metro station	6.8	28	12	6min/bus during the peak periods

4) Expected Impacts

After introducing the microcirculation bus in the showcase area, positive impacts are expected. Compared with walking or adopting existing bus services, the travel time of a microcirculation bus from the sampling points inside the blocks to Kuiqi Rd. Station will decrease (see Table 6-5). Therefore, by filling the service gap of the inner-block connection and providing a more efficient and direct way to the Kuiqi Rd. Station, more commuters, students, and parents are expected to ride the microcirculation bus.

By building a seamless public transport system, the attractiveness of the metro and the bus transport system will be effectively enhanced. Consequently, public transportation will become the first daily travel option for more citizens and the proportion of green mobility will accordingly increase.

The functional positioning of the micro-circulation bus caters to the actual needs of citizens. With smaller and more flexible minibuses, a more comfortable and convenient riding experience can be provided. Satisfaction levels of using the bus service could therefore be effectively enhanced.

Table 6-5 Travel Time from the Sampling Point to Kuiqi Rd. Station

Mode	A Block: Lvjing Intersection（绿景路口）	
	Current	Expected
Option 1: Walking	21min	21min
Option 2: Walking+Bus	18min	5min
Option 2: Max. Waiting Time	15min	6min
Option 2: Max. Travel Time	33min	11min

6.4 Implementation plans

6.4.1 Implementation timeframe

An implementation timeframe was decided through discussions with the Foshan TB. In consideration of levels of implementation feasibility, and in line with the city's current infrastructure construction plan, plans for bike lane upgrading for four transport corridors (Lanshi 1st Road, Huayuan East Road, Jinlan South Road, Lujing 1st Road) were selected for imminent implementation (2022-2024). Additional measures were proposed to be implemented in the long-term (2023-2025). Ongoing discussions are taking place to ensure funding is secured for the selected measures and to further specify the implementation schedule within the respective timeframes of each planned action. An implementation timeframe is outlined in Table 6-6.

Table 6-6 Implementation Timeframe

Measure	Location	Implementation time frame	Status of construction budget
Safe routes to school	Chancheng District	2022-2024	Waiting for budget allocation
Bike lane upgrading	Lanshi 1st Road	2022-2024	Waiting for budget allocation
	Huayuan East Road		Budget allocated
	Jinlan South Road		Budget allocated
	Lujing 1st Road		Waiting for budget allocation
	Huijing Road	2023-2025	Waiting for budget allocation
	Fenjiang South Road		
	Kuiqi Road		
	Huilan Road		
	Yongchao Road		
	Urban village street (unnamed)		
	Foshan Ave.		
	Jingyuan South Street		
	Jingyuan North Street		
	Luying East Street		
Microcirculation bus lines	Lujing 1st Rd.-Kuiqi Rd. Foshan Ave.- Jinlan Rd., S.	2022-2024	Waiting for budget allocation

6.4.2 Implementation subjects

Implementation subjects (government departments) were identified through analysing the responsibilities of different departments and how they match with the main actions of each measure. An illustration of these agents and their roles with each action are outlined in Tables 6-7, 6-8, and 6-9.

Table 6-7 Safe Route to School – Departments Responsible for Implementation

Safe route to school – Departments responsible for implementation	
Main action	**Department(s)**
Bike lane construction	Department of Urban Road Construction, Foshan TB 佛山市交通运输局城市道路建设科
Public space construction	Department of Urban and Rural Construction, Foshan Housing and Urban-rural Development Bureau 佛山市住房和城乡建设局城乡建设科 Department of Construction Management, Foshan Natural Resources Bureau 佛山市自然资源局工程建设管理科
Sidewalk renovation	Department of Urban Road Construction, Foshan TB 佛山市交通运输局城市道路建设科
Traffic sign	Chancheng Traffic Police Department, Foshan TB 佛山市交通运输局禅城综合执法支队
Greenery renovation	Landscape Greenery Department, Foshan City Management and Comprehensive Law Enforcement Bureau 佛山市城市管理和综合执法局园林绿化科

Table 6-8 Bike Lane Upgrading – Departments Responsible for Implementation

Bike lane upgrading – Departments responsible for implementation	
Main action	**Department(s)**
Bike lane construction	Department of urban road construction, Foshan TB 佛山市交通运输局城市道路建设科
Sidewalk and building frontage renovation	Department of urban road construction, Foshan TB 佛山市交通运输局城市道路建设科 Department of urban and rural construction, Foshan Housing and Urban-rural Development Bureau 佛山市住房和城乡建设局城乡建设科 Department of construction management, Foshan Natural Resources Bureau 佛山市自然资源局工程建设管理科 Landscape Greenery Department, Foshan City Management and Comprehensive Law Enforcement Bureau 佛山市城市管理和综合执法局园林绿化科
Car-lane rearrange	Department of urban road construction, Foshan TB 佛山市交通运输局城市道路建设科
Traffic sign	Traffic Police departments of different sub-districts, Foshan TB 佛山市交通运输局各区综合执法支队
Bike parking zone	Department of urban road construction, Foshan TB 佛山市交通运输局城市道路建设科

Table 6-9 Microcirculation Bus Lines – Departments Responsible for Implementation

Microcirculation Bus Lines – Departments responsible for implementation	
Main action	**Department(s)**
Bus line planning	Department of Planning and Development, Chancheng District Public Transportation Service Co., Ltd (Chancheng TC) 佛山市禅城区公共交通管理有限公司区域分公司规划发展部
Station setting	Department of Infrastructure, Chancheng TC 佛山市禅城区公共交通管理有限公司区域分公司基础设施部
Vehicle purchase	Operation Service Department, Foshan Public Transportation Service Co., Ltd (Foshan TC) 佛山市公共交通管理有限公司运营服务部
Operation	Chancheng TC 佛山市禅城区公共交通管理有限公司区域分公司
Ticketing	Operation Service Department, Foshan TC 佛山市公共交通管理有限公司运营服务部
Passenger flow data collection	Clearing, Accounting and Transportation Big Data Research Center, Foshan TC 佛山市公共交通管理有限公司子公司 清分结算与交通大数据研究中心 Operation Service Department, Foshan TC 佛山市公共交通管理有限公司运营服务部

6.4.3 Financial planning

SUMP as a planning tool aims to satisfy people's mobility needs as well as their business needs, and improve the overall quality of urban living environments. SUMPs aim to develop all transport modes in an integrated manner and are designed to cooperate across institutional boundaries. Instead of focusing predominantly on "hard" infrastructure-based transport planning and development, the Foshan SUMP Pilot Project aims at "soft"-oriented mobility planning by considering the socio-economic benefits brought about by its selected measures.

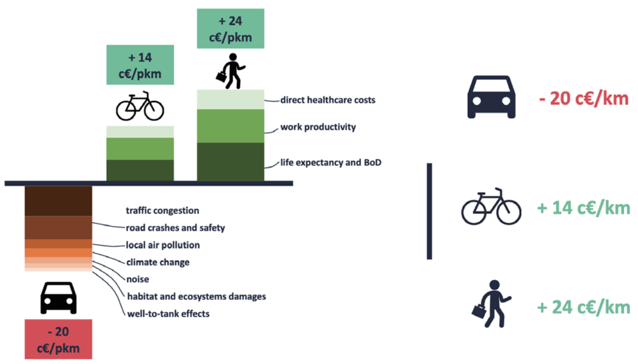
Socio-economic benefits can include improved local air quality and reduced noise pollution levels, reduced emissions contributing to climate change, and a context of improved accessibility, traffic safety, and liveability[23]. For example, one of the main drivers of creating economic growth is the clustering of human capital, productivity and creative skills, and highly qualified, creative people are more likely to work in liveable cities[24]. Additionally, vulnerable groups - including the mobility-impaired or economically disadvantaged - are more likely to find work, and thus generate tax revenue and purchasing power, when means of transportation and urban areas are barrier-free[25]. Furthermore, measures for the pedestrianisation of commercial areas implemented in many SUMPs can increase sales revenue. In Copenhagen, the pedestrianisation of one street contributed to a 30% increase in goods sales in a single year[26]. During the 2018 Christmas period in Madrid, the temporary closure of the main thoroughfare to cars led to a 9.5% increase in retail spending compared to 2017[27]. The cost-benefit analysis

23 Details at: https://www.eltis.org/sites/default/files/trainingmaterials/evidence_publishable_report_final.pdf .
24 Florida, R. Who's your city? How the creative economy is making where to live the most important decision of your life, 1st ed.; Basic Books: New York, US, 2008.
25 https://www.eltis.org/mobility-plans/12-what-are-benefits-sustainable-urban-mobility-planning.
26 Mattias Kärrholm, 2012. Retailising Space: Architecture, Retail and the Territorialisation of Public Space, Ashgate: Farnham and Burlington, VT, p 44.
27 Ayuntamiento de Madrid, 2019. 20 millones de transacciones comerciales confirman el aumento del gasto en Navidad tras la implantación de Madrid Central, https://diario.madrid.es/blog/notas-de-prensa/20-millones-de-transacciones- comerciales-confirman-el-aumento-del-gasto-en-navidad-tras-la-implantacion- de-madrid-central/.

that Arad, Romania, carried out for its SUMP showed that EUR 2.2 million was gained per EUR 1 million of investment[28] in the plan. The annual socio-economic surplus as a result of mobility measures in Stockholm is EUR 60 million[29].

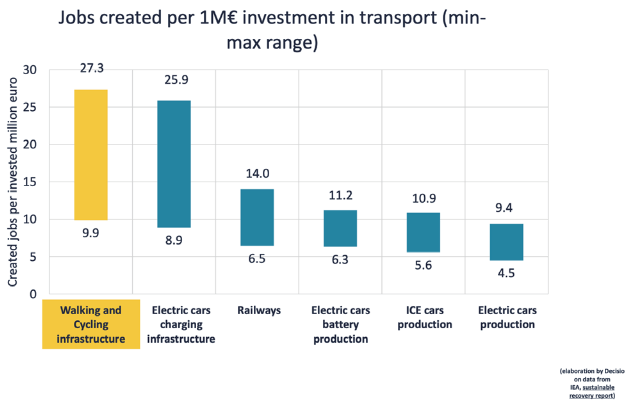
In particular, proposing active mobility systems not only contributes to promoting health and better environments, but also brings social and economic benefits. Therefore, constructing safe routes to school and upgrading bike lanes are very cost-effective measures that help benefit entire communities. First, high-quality bike and pedestrian systems help reduce traffic jams and traffic accidents, hence also reducing the time and cost of travel, as well as potential medical treatment costs. Second, building bike and pedestrian infrastructure would bring more job opportunities than constructing car infrastructure, railways, and producing vehicles, and further benefit society and the economy (see Figure 6-17 and 6-28). As discussions are ongoing to ensure funding for the selected measures, it also suggested that the local governments include the calculating of social and economic benefits in financial planning and cost-benefit analysis efforts.

■ Figure 6-27 Social and Economic Benefits of Cars, Bikes and Walking



(Source: Decisio)

■ Figure 6-28 Jobs Created per Unit of Investment in Transport



(Source: Decisio)

6.5 Monitoring and Reporting Scheme

This report section lists monitoring indicators for the three measures promoted for the showcase area, including considerations of measurements, methods, departments responsible, and the monitoring timeframe for plan actions. Monitoring indicators were identified based on the city-level SUMP objectives and in consideration of the levels of monitoring feasibility. The monitoring data should be aggregated annually and be reported to monitoring and management authorities (such as the Foshan TB and TC). It is recommended to conduct evaluations annually and publish corresponding monitoring reports to ensure the transparency of the monitoring and evaluation processes and provide results to the public, as well as to maintain regular communication with stakeholders.

[28] Municipal Arad, 2017.Planul de Mobilitate Urbană Durabilă al Municipiului Arad, pp 288-289.
[29] Eliasson, J., 2014. The Stockholm congestion charges: an overview. Centre for Transport Studies Stockholm, p. 34, www.transportportal.se/swopec/cts2014-7.pdf.

There are four monitoring indicators for the 'Safe Route to School' pilot measure (see Table 610). With a baseline value to be measured in advance, the value of the indicator is suggested to be collected annually after the implementation of the measure. If the proportion of students who commute by foot or bike is increasing, it implies that the measure can help to reduce the number of parents driving their children to school in the showcase area, thereby reducing the reliance on cars in general. After ensuring that more students commute by active modes, the increasing satisfaction rate and increasing time spent in the public activity space near school would also indicate the enhanced attractiveness of active mobility at the city-level.

The 'Bike Lane Upgrading' pilot measure has three monitoring indicators (see Table 611). Beside the baseline value, data needs to be collected once a year after each section is upgraded. If an increased bike-car ratio can be observed at the upgraded road section, it can be proved that the measure effectively reduces car dependence in the showcase area. At the same time, the improvement of average cycling times and satisfaction levels will verify the effectiveness of this measure in improving the attractiveness of active mobility at the city level.

The 'Microcirculation Bus Lines' pilot measure has a total of 6 monitoring indicators (see Table 612). After the opening of the microcirculation bus line, data collection should be carried out annually. The basic target for this plan element is that micro-circulation buses will reach a load factor of at least 50% in the first year of operation, and keep increasing by identifying and solving any identified problems relating to the new service. It is expected that the microcirculation bus service will be fully used by citizens for the first/last mile to the metro station, which in turn encourages mixed-mode seamless travel and improves the accessibility of urban rail-transit systems. It is also proposed to monitor the modal share and satisfaction of bus and metro systems respectively. It is expected that passengers' satisfaction with microcirculation buses reaches 50% in the first year and keep increasing in subsequent years. In this way, the flexibility of the bus service system is improved by enriching the types of bus services available. Moreover, enhanced satisfaction with public transportation makes people more willing to choose public transit options for travel, thereby achieving the objective of reducing car dependence at the city level.

Table 6-10 Safe Route to School – Monitoring Indicators

	Safe route to school – Monitoring indicators						
City-level objective	**Indicator**	**Definition**	**Target**	**Type**	**Data collection**	**Responsible**	**Frequency**
Reduce car-dependency	Ratio of students commuting by active modes	Students commuting by active modes/All students	Increase each year	Quant.	Survey	Foshan Bureau of Education, Foshan TB	Each year
Increase the attractiveness of active mobility	Satisfaction of traveling to school (among parents)	Ratio of respondents implying "satisfactory" among all respondents	Increase each year	Quant.	Survey	Foshan TB	Each year
	Satisfaction of traveling to school (among students)	Ratio of respondents implying "satisfactory" among all respondents	Increase each year	Quant.	Survey	Foshan TB	Each year
	Time spent in public space near school	Average time spent in public space near school per day of all respondents	Increase each year	Quant.	Survey	Foshan Bureau of Education	Each year

Table 6-11 Bike Lane Upgrading – Monitoring Indicators

	Bike lane upgrading – Monitoring indicators						
City-level objective	Indicator	Definition	Target	Type	Data collection	Responsible	Frequency
Reduce car-dependency	Bike – car ratio	Within a given time slot, the number of bike passed a road section/the number of cars passed	Increase	Quant.	Site survey and documentation	Foshan TB	Each year
Increase the attractiveness of active mobility	Satisfaction on bicycling experience	Ratio of respondents implying "satisfactory" among all respondents	Increase	Quant.	Cyclist survey	Foshan TB	Each year
	Level of physical activity	Average time spent on bicycling of all respondents	Increase	Quant	Cyclist survey	Foshan TB	Each year

Table 6-12 Microcirculation Bus Lines - Monitoring Indicators

	Microcirculation bus lines – Monitoring indicators						
City-level objective	Indicator	Definition	Target	Type	Data collection	Responsible	Frequency
Encourage mixed-mode seamless travel	Passenger load factor of microcirculation bus lines	The dimensionless ratio of passenger-kilometres travelled to seat-kilometres available	At least 50% in the first year; keep increasing in the following years	Quant.	Data collected by bus operation company	Chancheng TC	Each year
Reduce car-dependency	Modal share of bus	The percentage of travelers taking bus in total inner-city trips	Increase	Quant.	Residential travel Survey	Foshan TC	Each year
Reduce car-dependency	Modal share of metro	The percentage of travelers taking metro in total inner-city trips	Increase	Quant.	Residential travel Survey	Chancheng TC	Each year
Increase the efficiency and flexibility of bus service system; Encourage mixed-mode seamless travel;	Satisfaction of microcirculation bus service	Ratio of respondents implying "satisfactory" among all responded micro-bus passengers	At least 50% in the first year; keep increasing in the following years	Quant	Passenger Survey	Chancheng TC	Each year
Increase the efficiency and flexibility of bus service system	Satisfaction of general bus service	Ratio of respondents implying "satisfactory" among all responded bus passengers	Increase	Quant	Passenger Survey	Foshan TC	Each year
Increase the accessibility to urban rail-transit;	Satisfaction of metro service	Ratio of respondents implying "satisfactory" among all responded metro passengers	Increase	Quant	Passenger Survey	Foshan Rail Transportation Bureau	Each year

7 Next Steps

7 Next Steps

When the pilot measures are successfully implemented and the expected results are obtained as observed through monitoring and evaluation efforts, the effectiveness of the measures at the city-level in achieving the SUMP vision and objectives for the whole city can be strongly demonstrated. It is expected that the results from the pilot project will be able to be expanded and echoed at the city level.

For example, firstly, the mobility challenges in the showcase area are closely related to the ones at the city-level, providing evidence for the possible effective promotion and further implementation of SUMP in other parts of the city. Secondly, the successful implementation of pilot measures validates the feasibility of city-level strategies.

Specifically, the 'Safe Route to School' and 'Bike Lane Upgrading' actions validate 'Strategy 4: Optimise active mobility infrastructure and provide a safe, enjoyable and inclusive environment' for active mobility'. Meanwhile, 'Microcirculation bus lines' validates 'Strategy 1: Shaping an X-shaped rail transit network fitting to the urban structure', 'Strategy 2: Building multi-level bus system matching the passenger flow corridors and fully responds to public needs', and 'Strategy 3: Establishing an integrated multimodal public transport system which encourages seamless green mobility'. 'Strategy 5: Strengthening motor vehicle management' has policy outcomes, but its necessity has also been indirectly verified by the effectiveness of taking actions to clear road-side parking problems to create a safe walking and cycling environment, as demonstrated in the pilot measure.

Therefore, it is expected that the SUMP Pilot could be effectively expanded to the city-level in the future, together with a robust financial plan and concrete monitoring strategy.

The Foshan SUMP Pilot project therefore not only validates the feasibility of implementing a full Foshan SUMP at the city level, but also offers evidence of how to further integrate the concept of SUMP in other Chinese cities' urban transport planning systems, while learning from the successful experience of Foshan.

China's economy and overall development processes are experiencing a transformation from quantity-oriented growth to quality and efficiency-based development. Traditional Chinese transport planning pays more attention to the construction and expansion of infrastructure, but now that the building of infrastructure foundations has been basically completed, the transformation of the goals of Chinese planning is very urgent. In light of China's sustainable development and dual carbon goals – peaking carbon dioxide emissions before 2030 and achieving carbon neutrality by 2060 – sustainability and people-centred planning are now clearly the core goals of transport planning reform.

SUMPs, as a planning tool, aim at satisfying people's mobility needs as well as the needs of small businesses, and at improving the quality of urban living. The SUMP methodology helps to develop all transport modes in an integrated manner and promote cooperation across institutional boundaries. Instead of focusing predominantly on "hard" infrastructure-based transport planning and development, SUMPs aim at "soft"-oriented mobility planning. As such, SUMPs can effectively further support Chinese cities in achieving their transport development targets as derived from national level policies.

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