Shaping the Future of Infrastructure

Regeneration of Renmin viaduct neighbourhood on the basis of balancing Mobility and Livability

GUANGZHOU, CHINA

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ABSTRACT

Urban viaducts are essential components of main road networks in large cities. Balancing the enhancement of urban traffic efficiency with the preservation of urban space vitality is a significant challenge for many major cities in China. The Renmin Road Viaduct in Guangzhou exemplifies the conflict between unsustainable traffic development and daily life, serving as the primary focus of this study.

This project aims to achieve the macro goals of community livability and sustainable transportation through the integrated transformation of the Renmin Road Viaduct. The objective is to convert the viaduct from a negative urban space into one that positively impacts the city, thereby improving the living conditions of surrounding residents and alleviating messy traffic situations.

The project employs a combination of literature review, GIS traffic data processing and analysis, and surveys. By focusing on cultural, economic, social, and ecological dimensions, the design goals of "neighborhood livability" and "sustainable mobility" can be achieved through the transformation of integrated infrastructure. Transforming the Renmin Road Viaduct into a pedestrian-priority bridge offers innovative ideas and references for the renovation of similar urban viaducts in China.

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MOTIVATION

VIADUCT

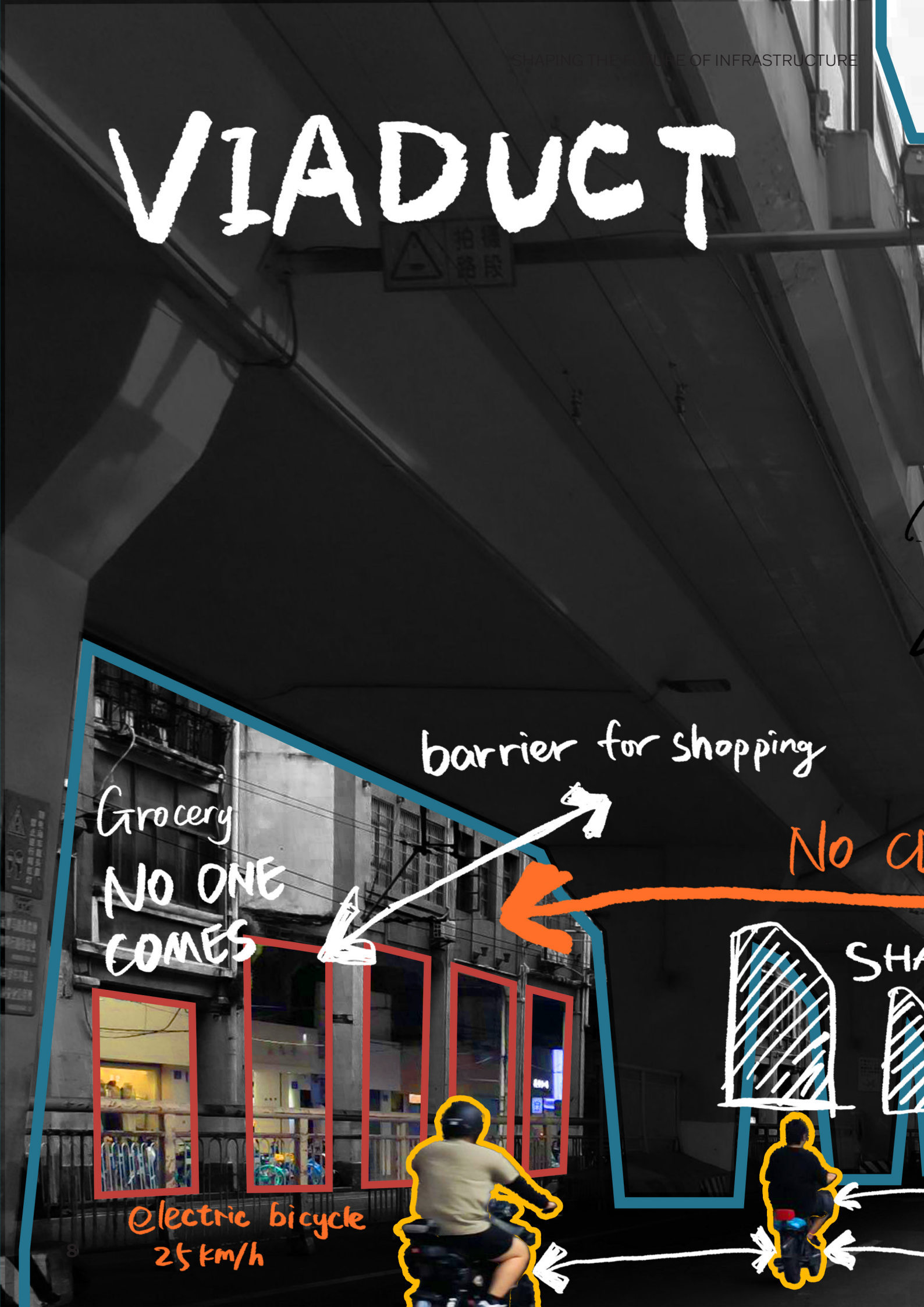
barrier for shopping
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Figure 1.1: Renmin viaduct view, photo by authour

Figure 1.2: Renmin viaduct view, photo by authour

Motivation

DRAMATIC PHENOMENON

In 2022, when I first walked near the Renmin viaduct, I felt that the urban environment there was quite unpleasant.

Under the bridge, it's a messy frenzy as electric bicycles dart between cars, exacerbating the gridlock. The air is thick with pollution due to the ceaseless convoy of vehicles. Crowds of people swarm the narrow pedestrian walkways, adding to the mayhem.

On the bridge, an unrelenting stream of cars pumps out noxious fumes, intensifying the city's pollution woes. Shockingly, there's not a trace of greenery to shield the nearby residential buildings from this noxious onslaught, despite their perilously close proximity.

In the immediate vicinity of the bridge, once-thriving stores now languish in desolation, grappling with the harsh reality of vanishing foot traffic.

But why such a negative place no one is trying to change it?

Motivation
NEWSPAPERS&ARTICLES


羊城晚报
YANGCHENG WANBAO
20
荔湾区第
总事在服务

Figure 1.3:News of the completion of the South Renmin Road Viaduct, (SOURCE:Yangcheng Evening News, June 20, 1987)

Within almost 30 years people are keeping discussing how to change this big thing.

From the time of completion of tens of thousands of people flocked to the bridge to experience and become famous throughout the country, to today's "demolition sound", Guangzhou People's Road Viaduct during the 30 years of the huge differences encountered, is China's urban bridges to transform the history of the development of a silhouette. An urban overpass and viaducts, in the play of urban transportation functions at the same time, but also become a striking urban landscape. Now in some cities, some bridges are considered to be congestion points and urban "scars", was called to remove. (Xinhua News Agency, Beijing, September 29,2016)

The Renmin Road business district was once Guangzhou's busiest business district and financial center, but after the construction of the Renmin Road Viaduct, the district fell into decline. "The arrival of the viaduct, making the decline of the business district is inevitable." said Lai Baosong, head engineer of the Guangzhou Municipal Landscape Architecture Bureau. It also represents a sentiment that viaducts are "no longer as popular as they once were".

"From a livability point of view, large urban bridges, if not properly planned, have the potential to sever the intimacy between people and people, and people and buildings." Cheng Shi dong, director of the Urban Transportation Office at the National Development and Reform Commission's Institute of Comprehensive Transportation, said.

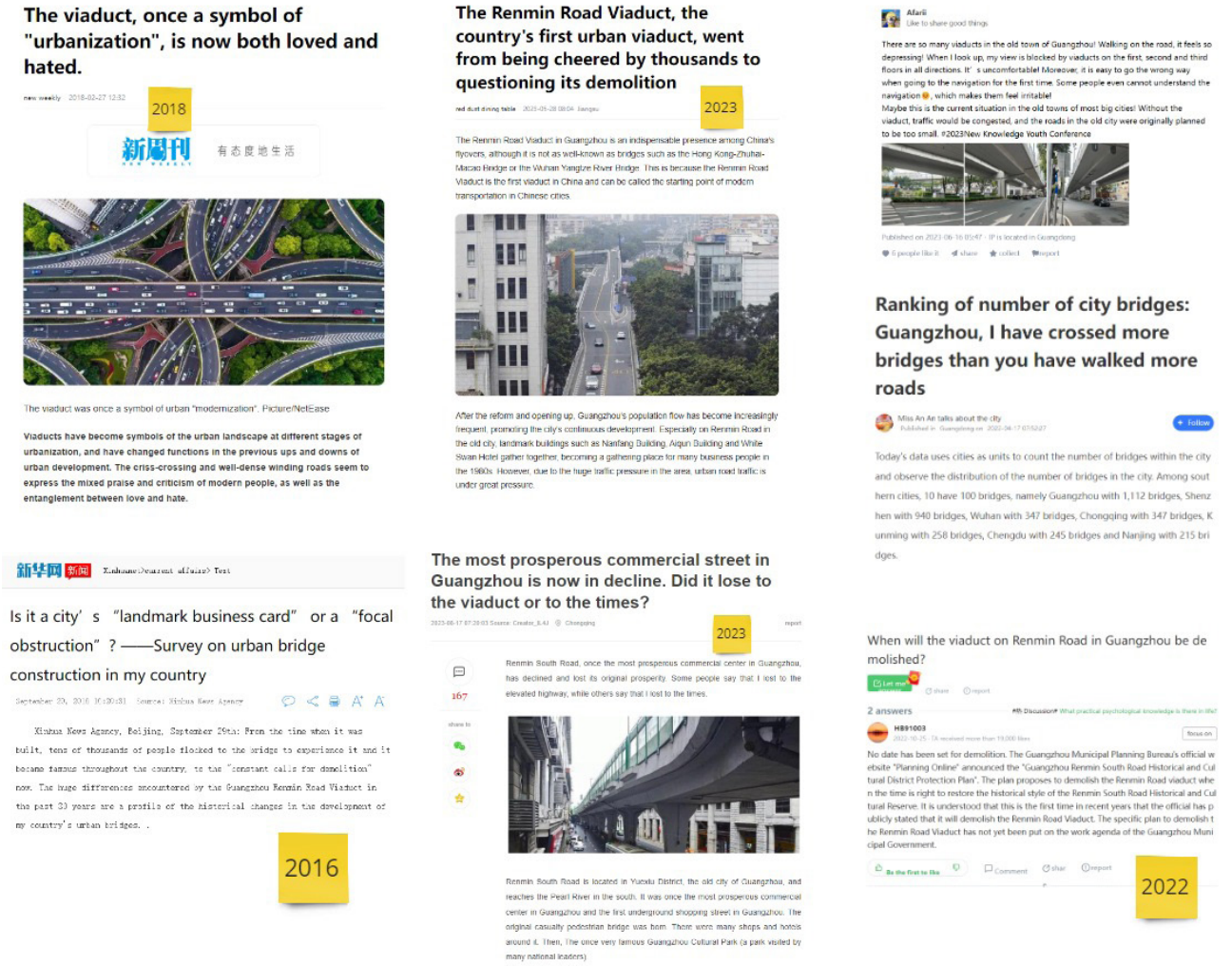


Figure 1.4:News of the Renmin Road Viaduct Collage, (SOURCE:Xinhua News, August 20, 2016)

The demolition of the Renmin Road Viaduct has always been a contentious issue among the citizens. In October 2011, the "Renmin South Road Historical and Cultural District Conservation Plan" was made public. The plan aims to protect the traditional arcade commercial district's appearance, highlight the historical and cultural characteristics of the Renmin South Road historical preservation area, and revitalize the commercial and trade functions of the traditional commercial district. Notably, the plan suggests that the viaduct could be demolished when the time is right.

The "Guangzhou Transportation Development Strategic Plan," released in 2020, also proposed "studying the gradual removal of the motor vehicle function of elevated roads within the historic city area, reviving traditional commercial districts, and restoring the cultural appearance of historic streets. For example, studying and analyzing the plan for the removal or functional adjustment and transformation of the existing Renmin Road Viaduct."

Figure 1.5:Current status of public transportation along both sides of People's Road (source: ITDP)

Personal Manifesto

With the advancement of urban transportation, Guangzhou has witnessed the establishment of various infrastructure, among which the Renmin South Road Viaduct holds the distinction of being the city's first elevated roadway. During the 1980s and 1990s, Renmin Road bustled with activity as a vibrant street.

However, in the present day, this concrete viaduct has transitioned into a less favorable element within this densely populated city. Its elevated, substantial structures cast prolonged shadows over the urban landscape, creating an overall impression of dim and enclosed spaces. The viaduct's substantial noise, pollution, safety concerns, and sheer size have transformed it into a disruptive force in our daily lives.

Over the course of 31 years, the Renmin Road Viaduct has stood as a witness to Guangzhou's development and transformation. In the contemporary urban landscape, while Guangzhou enjoys a well-connected transportation network, the fate of the viaduct remains a subject of considerable debate. The dilemma lies in whether to restore its former glory, and the future of the Renmin Road Viaduct is a multifaceted and intricate question.

The quandary remains: Should the Renmin Road Viaduct be demolished or preserved?
As an urban designer, I will strive to change this uncomfortable living situation. The future of this viaduct will be reshaped by me.

02

CONTEXT

Context

CONTEXT OF GUANGZHOU

Current Overview of Guangzhou

Guangzhou is a highly urbanized megacity, serving as a commercial and cultural hub in southern China and one of the busiest cities nationwide.

Guangzhou boasts a large population. According to the 2023 Guangzhou National Economic and Social Development Statistical Bulletin released by the Guangzhou Bureau of Statistics on March 30, the latest population data reveals that Guangzhou's permanent population stands at 18.827 million.

As one of China's forefront cities in reform and opening up, Guangzhou's economy is supported by three pillars: the service industry, manufacturing, and high-tech industries. In 2021, Guangzhou's GDP reached 2.511 trillion RMB, ranking fourth among Chinese cities. (Guangzhou Bureau of Statistics, 2024)

Guangzhou also has a highly developed transportation network. According to Guangzhou Railway Bureau data, in 2023, the average daily passenger volume of Guangzhou Metro reached 8.572 million, an increase of 33% compared to 2022. This indicates a continuous recovery in population attraction and growing urban vitality (Li, 2024). The urban public transportation system includes the Guangzhou Metro, BRT (Bus Rapid Transit), and an extensive bus network. Since its opening in 1997, the Guangzhou Metro has rapidly expanded to 14 lines, with a total length exceeding 500 kilometers (2022 Guangzhou Transportation Development Annual Report, Guangzhou Transportation Planning Research Institute).

Additionally, Guangzhou represents Lingnan culture, a branch of southern Chinese culture, characterized by unique customs, arts, cuisine, architecture, and gardens. Guangzhou is one of the first national historical and cultural cities announced by the State Council in February 1982, with over 4,000 years of cultural history and more than 2,000 years of urban civilization (Ni, 2009). The city's rapid development has brought advanced infrastructure and skyscrapers while preserving many historical buildings and traditional markets.

Urban Planning and Development Focus

In 1978, in the context of reform and opening up, the government proposed shifting Guangzhou's focus to economic construction. Guangzhou's urban functions began transitioning from production to living, transforming from an industrial city to a comprehensive city. This led to continuous urban expansion and construction from the 1980s to the 2010s, including infrastructure such as housing, roads, and subways, as well as social aspects like education, technology, and the Greater Bay Area cultural sphere (Huang, 2008). 3It can be said that Guangzhou has been striving to balance modernization and traditional preservation in its urban planning and development.

Figure 2.1:Guangzhou City, (SOURCE:Xiaohongshu, Apirl 5, 2023)

Figure 2.2: Guangzhou Night View
SOURCE :©SLS

Figure 2.3: Guangzhou Urban Village View
SOURCE :©GUOSHI

Coexistence of Rapid Development and Old Urban Construction

The extensive network of Viaducts is a significant symbol of Guangzhou's rapid urbanization. These highways demonstrate the city's efforts to modernize and enhance efficiency in traffic solutions, aiming to manage the vast traffic flow brought by rapid population growth and robust economy.

At the same time, Guangzhou has numerous urban villages. Urban villages are a product between "city" and "village," completing the city's development layout while retaining the original village texture, achieving modernization while preserving traditional lifestyles and cultural customs. These are densely populated communities with a long history, surrounded by urban expansion. These villages stand in stark contrast to the city's high-rise buildings and wide elevated highways.

In China, the urban village is not only a living space, but also retains the traditional social network based on blood relationship and geography (He, 2019), which symbolizes the "big home" in the villagers' mind. "Home" in this context includes the objective physical living environment, as well as the assemblage of emotions that the people in it feel towards the environment (Sixsmith, 1986). This sense of home is believed to create a sense of well-being during the transition of renovating a living space (Van Hoof et al., 2016). Urban villages generally have ancestral halls, community altars, private schools, and temples, serving as spiritual anchors for many Guangzhou residents. They represent a more traditional way of life, continuously existing in the rapidly changing urban structure, providing affordable housing, and maintaining community awareness and cultural continuity during urban development (Lin et al., 2023).

The coexistence of high-rise buildings and urban villages in Guangzhou creates a unique urban tapestry. Viaduct symbolize the city's desire for modern infrastructure and connectivity, while urban villages deeply remind people of their cultural heritage and the socio-economic disparities brought by rapid urban development.

Context
RENMIN VIADUCT NEIGHBOURHOOD

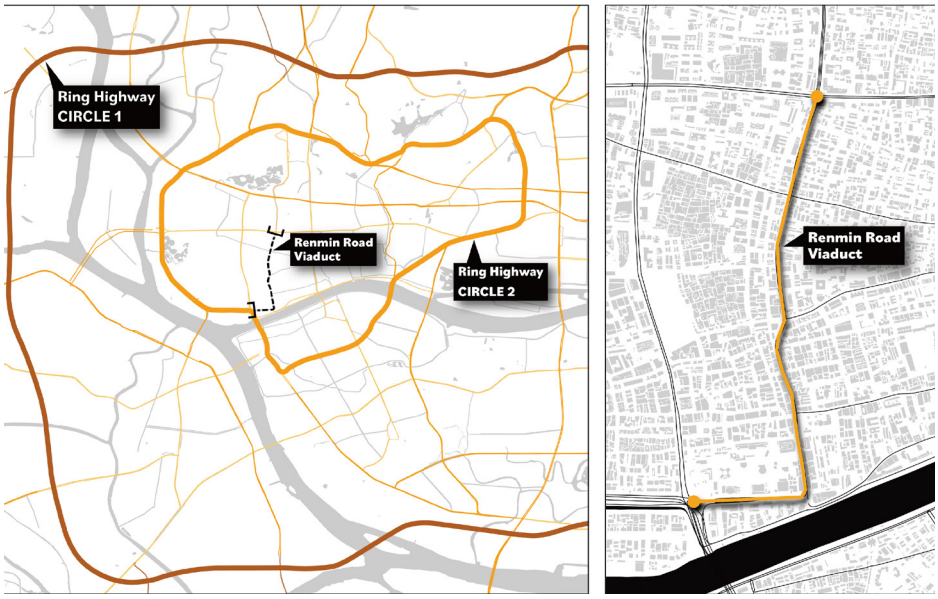


Figure 2.4: Location of the neighbourhood,made by author

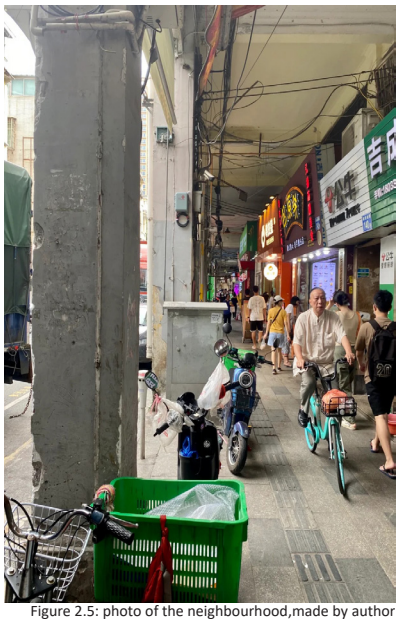


Figure 2.5: photo of the neighbourhood,made by author

The Renmin Road viaduct neighborhood is a typical area where densely packed urban villages, extensive transportation facilities, and numerous historical buildings coexist. Located at the junction of Yuexiu District and Liwan District in Guangzhou, it falls within the scope of Guangzhou's old city district. This is a typical urban mixed area, surrounded by a large number of retail businesses, old residential buildings, and famous tourist attractions in Guangzhou, covering an area of about 300 hectares. The area is densely populated, with a significant aging population and relatively outdated urban infrastructure. As previously mentioned, this neighborhood mirrors Guangzhou's own development—a microcosm of rapid urbanization, forgotten traditions, and neglected indigenous residents.

This area boasts many cultural heritages, such as the Chen Clan Ancestral Hall, Guangzhou Opera House, and numerous historical relics. The street layouts, traditional architecture, and historical markets in these regions showcase the unique charm of Lingnan culture. Besides being a display area for culture and history, the neighborhood also has a rich retail commerce sector. Affordable goods provide convenient living for residents. Despite the construction of new commercial centers in Guangzhou's new districts, the markets and shops in the old city remain an essential part of the local residents' daily lives (Huang, 2008).

At the same time, the infrastructure here is relatively outdated, with insufficient public service facilities such as education, healthcare, and green spaces. Due to the limited space and dense buildings in the old city, it is challenging to implement new planned facilities. For example, traffic improvement plans and modernization constructions often face difficulties due to a lack of space (Di, 2022). There is a certain conflict between preserving historical buildings and cultural relics and meeting the demands of modern urban life.

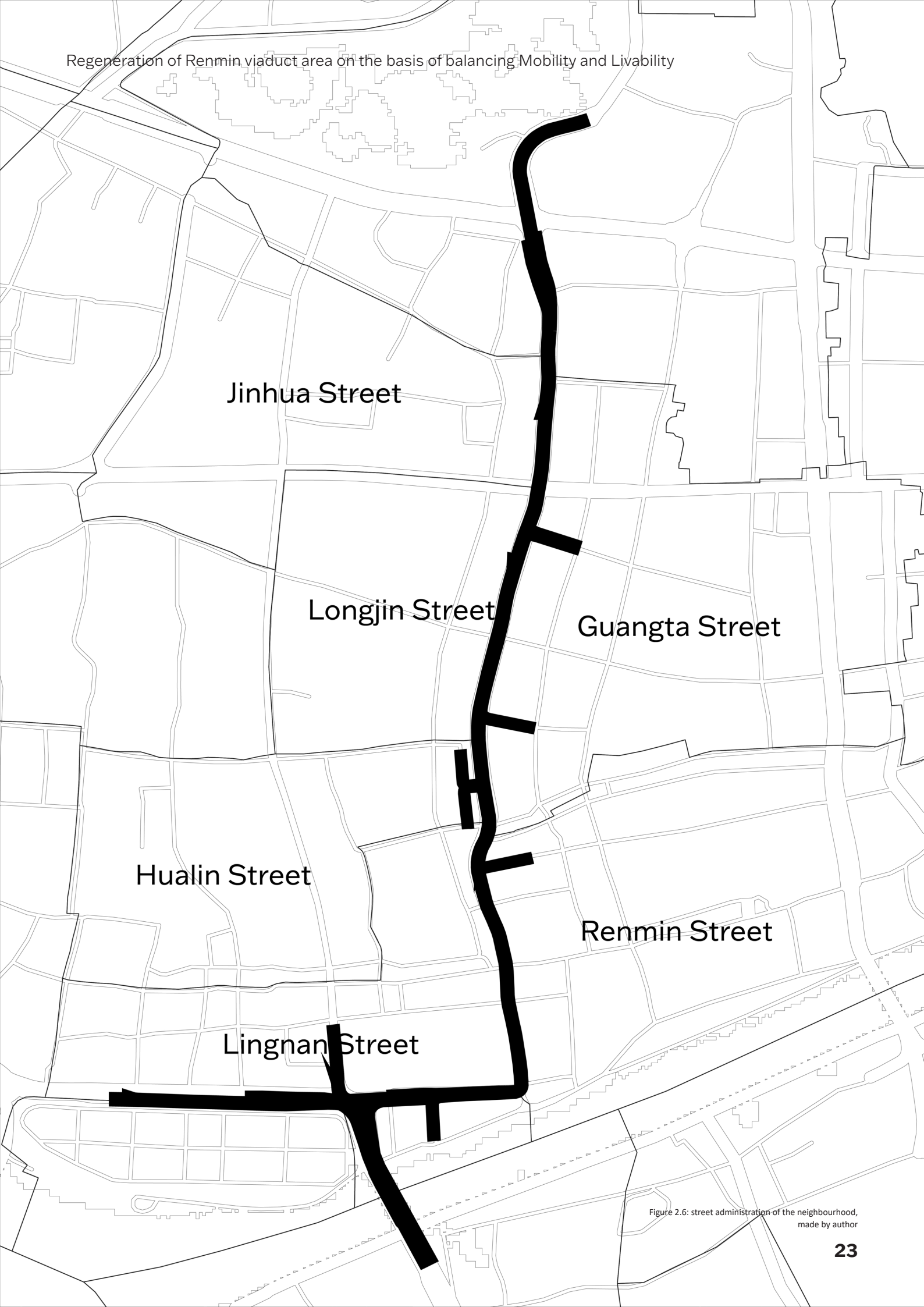


Figure 2.6: street administration of the neighbourhood, made by author

Figure 2.7:Former Yangcheng Evening News photojournalist Zhu Sui Feng's photos taken before the opening of the elevated People's Road have become classics.

Context

DEVELOPMENT OF THE VIADUCT

Overview of Renmin Road Viaduct

Renmin Road originally served as the west city wall of ancient Guangzhou. Since 1918, it has gradually been developed following the demolition of the old city wall, giving it nearly a century of history. The Renmin Road viaduct, built in 1987, is the first urban elevated road in China. It stretches approximately 3.5 kilometers from Liuhua Road in the north to the Inner Ring Road in the south, featuring a two-lane elevated road on the upper level and a four-lane ground road below, with a designed speed of 40 km/h (Di, 2022).

Before Construction

Initially named Taiping Road, Renmin South Road was once the boundary line of Guangzhou's ancient city wall. From the 1950s to the 1980s, this area was filled with arcaded commercial streets and was a commercial center of Guangzhou.

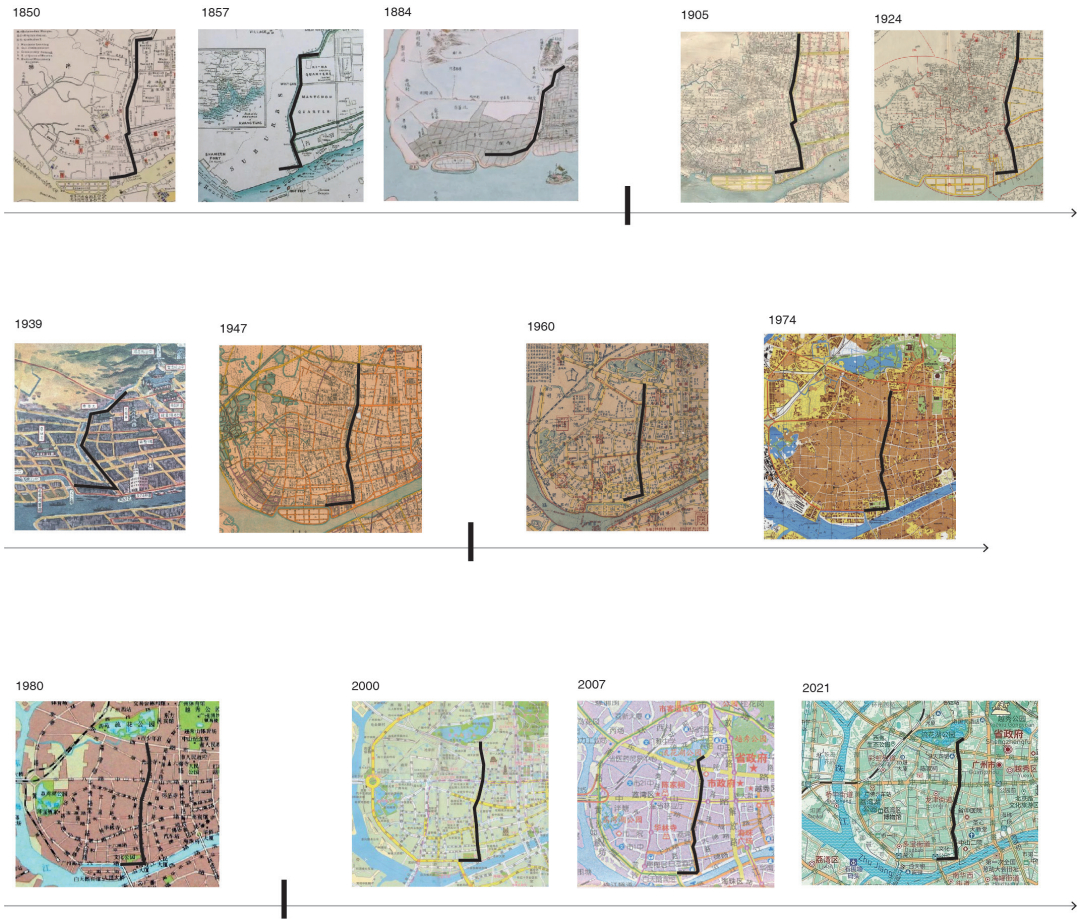
Motivation for Construction

By the 1980s, Renmin Road was severely congested, with traffic volumes exceeding 3,000 vehicles per hour and numerous intersections causing frequent blockages. To address this, the government proposed constructing an elevated road. In 1987, as Guangzhou prepared to host the Sixth National Games, the city faced a significant increase in vehicle ownership and worsening traffic jams. Inspired by experiences in Japan, the then Deputy Mayor of Guangzhou decided to build an elevated road to improve urban traffic conditions. The construction of Renmin Road Viaduct symbolized the pinnacle of China's infrastructure technology at that time. Its completion marked the beginning of a new era of three-dimensional traffic solutions in Guangzhou, pioneering the resolution of traffic issues in old urban areas nationwide.

Peak Period

Upon completion, the Renmin Road Viaduct attracted visitors from across the country. On September 20, 1987, the viaduct opened for sightseeing, and the dense crowds at the southern end formed a human character shape, captured in a classic photograph titled "People." (image)

The viaduct added over 79,000 square meters of road area to Guangzhou. After its opening, travel between Renmin South and Renmin North took only a few minutes. Some taxi drivers reminisced that waiting for traffic lights on the ground took longer, though this might be an exaggeration. Undoubtedly, the viaduct significantly alleviated north-south traffic congestion on Renmin Road. In the subsequent decade, traffic on both the viaduct and the ground road below was smooth and orderly. A traffic police officer interviewed in the 2000s remarked, "Since the viaduct opened, there hasn't been any traffic congestion in this area."(He, 2015)



Meaning and role	boundary	Commercial street	Commercial street,main road	main viaduct,transportation	Infrastructure affecting normal life	commercial and historical street
Time	1850-1884	1905-1949	1949-1980	1986-2011	2011-now	future
URBS						**?**
CIVITAS						
TOPOS	Boundary of the old city wall of Guangzhou, next to the moat	The Riding Mansion Commercial Street, the commercial center of Guangzhou, dining, entertainment, shopping, the "Wall Street" of Guangzhou.	Streets rebuilt after the war were widened to become the city's main arterials, with reduced commercial properties	Construction of the first viaduct in China during the economic boom period	Commercial decline and relocation of urban centers with gradual negative impacts	Current government planning

Figure 2.7:Viaduct Development Timelinemade by author

Decline to Present

However, constrained by urban land conditions and construction costs at the time, the Renmin Road Viaduct also had numerous negative impacts on the surrounding urban space. With the shift in Guangzhou's urban traffic center, the viaduct's former prosperity has faded. Surrounding the viaduct are eight historical and cultural districts. Renmin South, once Guangzhou's bustling commercial hub, has seen its prominence and vitality decline, increasingly unable to meet the demands of high-quality development. Since 2004, with the opening of several parallel expressways and major arterial roads, there have been calls to demolish the Renmin Road Viaduct, leading to ongoing debates about whether to remove or retain it (Di, 2022).

For many Guangzhou residents, the viaduct has become a part of the city's history, symbolizing three decades of urban development and shared memories (He, 2015). At a symposium on Guangzhou's traffic reform, Shi Anhai, Vice Chairman of the 8th Guangdong Provincial Committee of the CPPCC, stated that for Guangzhou citizens, the Renmin Road Viaduct is not just a bridge but a repository of shared memories and emotions. Many residents have vivid recollections of the day the viaduct opened for sightseeing, the views from the bridge, and their daily commuting experiences, all integral parts of their lives.

From the development process of the viaduct itself, it stands as a cultural heritage that carries the memories of the city and its residents. Firstly, there are many historical buildings on both sides of the viaduct, which can be considered cultural heritage. Secondly, the viaduct itself, although not traditionally viewed as worthy of conservation, forms an essential part of the urban character, epitomizing unique population density, historic nature, street patterns, or other urban morphological or cultural features, and can also be seen as part of the cultural heritage (Christopher & Sutherland, 2007).

Such cultural heritage further stimulates the place memory of nearby residents. In 1952, Maurice Halbwachs explained the importance of collective memory and resident participation in "On Collective Memory." Following this, from Colin Rowe's "Collage City Theory" to Kevin Lynch's "The Image of the City," and Norberg-Schulz's "Genius Loci: Towards a Phenomenology of Architecture," these humanistic planning and design ideas, like place memory, emphasize people's feelings and historical sentiments within a space. The physical elements in a city may dissipate over time, but place memory carries the spirit of different eras, creating a strong sense of belonging and identity, making places distinctive and charming. This is crucial for enhancing residents' sense of identity and cohesion (Lei et al., 2021).

Therefore, the cultural and historical significance of the viaduct neighborhood is worth protecting and further discussing regarding its potential application in the transformation and redesign of the viaduct.

Context

FUTURE MOBILITY TREND OF GUANGZHOU

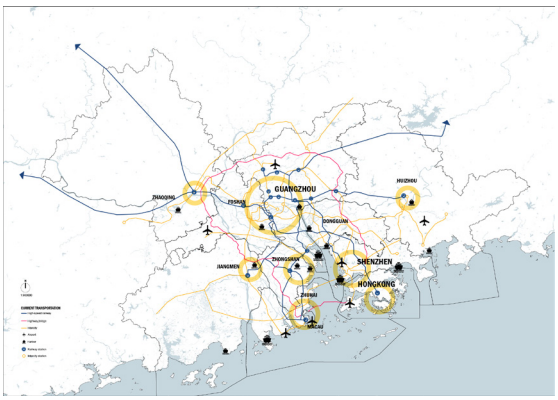
From the development history of the Renmin Road Viaduct discussed earlier, it is evident that the viaduct was initially constructed solely to alleviate road congestion, a traditional method of addressing urban traffic issues. However, in the context of sustainable development today, Guangzhou's vision for future urban development and transportation systems has evolved, necessitating a redefinition of the viaduct's role and significance.

Guangzhou's transportation development is transitioning beyond the era of rapid growth, with citizens' travel demands and modes becoming more diversified and increasingly favoring individual travel methods. In recent years, green travel modes (including walking, cycling, electric bicycles, regular buses, and rail transit) have remained high. The city's average daily travel volume is 44.37 million trips, a decrease of 0.9% from the previous year. The green travel ratio in the central urban area is 77%, ranking among the top in China's megacities. The metro network spans 621 kilometers, with an average daily passenger volume of 6.46 million, the highest in the country (2024 Sustainable Development Report on Rail Transit).

Changes in urban family structures also significantly impact transportation demand. It is projected that by 2035, Guangzhou will enter a period of severe aging. The deepening aging population poses higher requirements for the convenience, comfort, safety, and inclusiveness of future urban transportation, necessitating a more human-centered sustainable transportation model (Liang, 2022), especially in areas with severe aging, such as the Renmin Road Viaduct neighborhood.

Additionally, rapid technological advancements are driving profound changes in urban transportation modes. New energy vehicles have become the main growth driver for motor vehicles, and electric bicycles are rapidly increasing. According to the 14th Five-Year Plan for the Innovation and Development of Intelligent and New Energy Vehicles in Guangzhou released by the Guangzhou Development and Reform Commission in March 2022, the development goal is to have the city's automobile production capacity exceed 5 million by 2025, with new energy vehicles accounting for more than 2 million, making Guangzhou one of the top three cities in the country. The future of Guangzhou's transportation will be more automated and intelligent.

Therefore, although the viaduct has been effective in addressing immediate traffic demands, its long-term impact and limitations are increasingly at odds with Guangzhou's goals of pursuing a greener, smarter, and more human-centric transportation system. In formulating future urban transportation plans, Guangzhou may need to reconsider the role of the viaduct within the city's transportation system.



South Renmin Road in the 1930s, Guangzhou Municipal Planning Institute (GZPI)

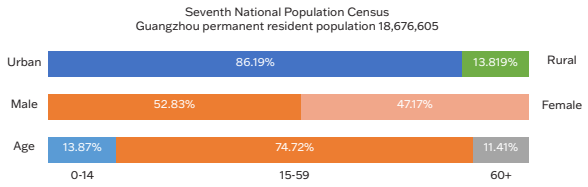


Figure 2.8:Bulletin of the Seventh National Population Census of Guangzhou, 2021

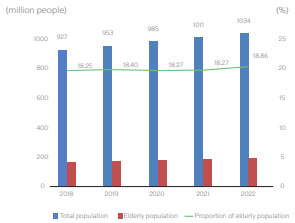


Figure 2.9:Changes in the elderly population in Guangzhou, 2018-2022

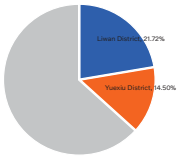
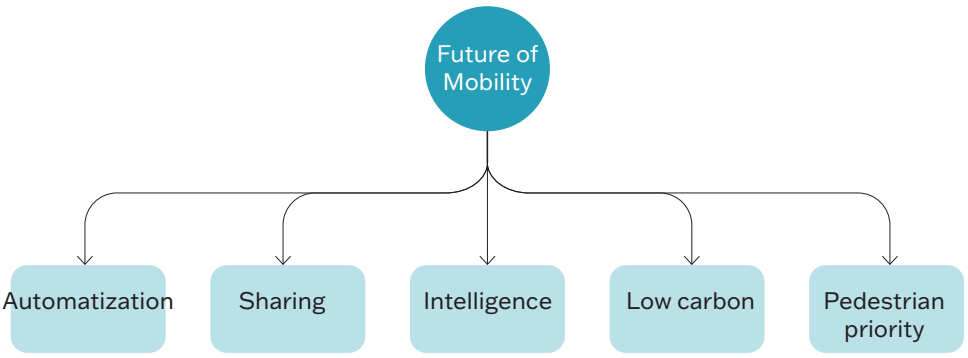
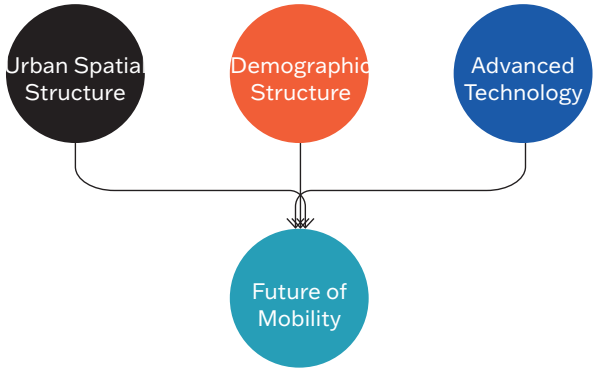


Figure 2.10:Regional Distribution of Elderly in Guangzhou, 2022

Figure 2.11:Bulletin of the Seventh National Population Census of Guangzhou, 2021





Context
LITERATURE REVIEW

Sustainability definition

It is important to emphasize at the outset that although sustainability is not explicitly used in the research aims and research questions, however, most of the theories addressed in the project actually fall within the broad topic of sustainability. Therefore, a clarification on what is concerned with sustainability will be provide in this project.

The World Commission on Environment and Development provided in 1987 a widely used definition of sustainability: a sustainable development "is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987).

The concept usually involves the balancing of economic, social and environmental dimensions with the aim of achieving long-term development. (Fig.1) This illustrates that sustainability is an ever-changing process concept that manifests itself differently in different research directions, and there are various means on how to achieve it. The social, economic and environmental dimensions occupy different positions in a hierarchy depending on the specific sustainability issue undertaken. The interactions between these dimensions are also dynamic, with changes in one dimension impacting the other dimensions. (Christopher et al, 2005)

Normally, in the context of urban planning and design, for a city to be considered sustainable, certain important elements must be present. These elements (sustainable education, renewable energy, energy efficiency, sustainable transportation, sustainable buildings, waste management, etc.), informed and willing inhabitants, when combined with dividends of sustainability may be realized (Ahmed et al, 2019). Sustainability considerations are now reflected in many common urban design principles, such as green infrastructure, mixed-use development and compact city.

Significantly, culture is gradually being emphasized as another major component of sustainability, except for the social, economic and environmental dimensions (Fig.2). Culture is regarded as the set of distinctive spiritual, material, intellectual and emotional features of society or a social group, in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs (UNESCO, 2001). The environmental dimension mainly emphasizes the harmonious coexistence of human beings and nature. The social dimension focuses on social justice, community participation and human relations, while the economic dimension refers to the quest for long-term benefits. Culture was not considered a separate dimension since it was part of the social dimension of sustainability until the last decade (Mehdinezhad & Nabi, 2016).

Culture is often directly categorized as a part of "society," but in the context of Guangzhou, due to its rich geoculture, including art heritage, historical accumulations, and traditional customs, the significance of culture differs from the "social" aspect, which emphasizes contemporary human interactions. In the sustainable urban development of this project, the importance of the cultural dimension will be equal with the other three key terms. The cultural dimension will dig into the value of history and traditional customs to meet current and future human needs.

In the following context of other related theories, social, economic, cultural, and environmental will appear as four equal values.

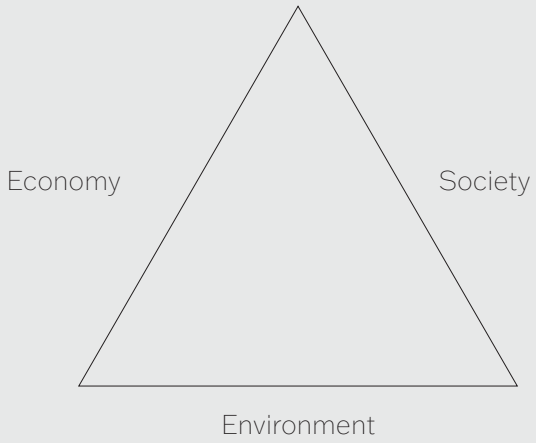


Figure 2.12:Triangle of sustainable development.
Source: Adapted from(UNESCO, Barcelona Cultural and UCLG, 2009)

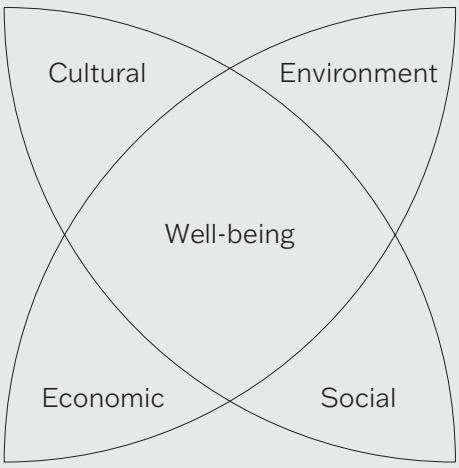


Figure 2.13:Four well-beings of community sustainability.
Source:Adapted from(New Zealand Ministry for Culture&Heritage,2006)

Sustainable mobility

Generally speaking, mobility refers to the movement of people and goods across different locations efficiently and effectively. It involves the availability and accessibility of transport infrastructure that enables individuals to travel from one place to another with ease. This encompasses various modes of transport such as roadways, railways, airways, and waterways, and includes both private and public transport options. The definition of sustainability mentioned before is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs(WCED, 1987).

Therefore, sustainable mobility needs to consider the possible future impacts of current transportation construction on the city as part of sustainability and mobility development with a shift from a car-centric to a more people-centered and environmentally sustainable view of urban transport planning.

In the first few years, sustainable mobility is often associated with environmentally relevant topics such as carbon emissions and non-renewable energy consumption, with an emphasis on reducing the environmental threat posed by transportation. It was first presented in the 1992 EC Green Paper on the Impact of Transport on the Environment, which followed up on the seminal report Our Common Future and its discussion of the global challenge of sustainable development. The Green Paper recognized that although transport had brought huge benefits to the global economy and had opened up world trade and travel, there were substantial costs, particularly in terms environmental impacts (e.g. CO2), social costs (e.g. from accidents), and a complete dependence on non-renewable resources (i.e. oil) (Holden et al, 2020). Sustainable mobility is usually achieved by promoting public transportation, encouraging non-motorized travel, and encouraging the spread of new energy vehicles.
However, in order to achieve sustainability, it is also necessary to think about how to minimize the negative impacts at the economic, cultural and social levels. Any attempt to develop narratives of sustainable mobility must address the three imperatives of sustainable development: satisfying human needs, ensuring social justice, and respecting environmental limits (Holden et al, 2020).

This table from Marshall (2001) also shows what a more sustainable transportation construction model is by comparing traditional transportation construction and sustainable transportation construction models. Traditional approaches focus on the use of motor vehicles. It treats streets as roads for vehicles, with the goal of accelerating traffic flow and shortening travel times, often resulting in segregation of pedestrian and vehicular flows. While sustainable mobility approach emphasizes the social dimension and accessibility, focuses on whether people are in vehicles or on foot, and treats streets as public spaces, promoting prioritization of pedestrians and cyclists, considering environmental and social factors, and viewing travel as Valuable activities, not just derived needs. This approach pursues the integration of people and traffic rather than segregation.

Contrasting approaches to transport planning

The conventional approach— transport planning and engineering	An alternative approach—sustainable mobility
• Physical dimensions	• Social dimensions
• Mobility	• Accessibility
• Traffic focus, particularly on the car	• People focus, either in (or on) a vehicle or on foot
• Large in scale	• Local in scale
• Street as a road	• Street as a space
• Motorised transport	• All modes of transport often in a hierarchy with pedestrian and cyclist at the top and car users at the bottom
• Forecasting traffic	• Visioning on cities
• Modelling approaches	• Scenario development and modelling
• Economic evaluation	• Multicriteria analysis to take account of environmental and social concerns
• Travel as a derived demand	• Travel as a valued activity as well as a derived demand
• Demand based	• Management based
• Speeding up traffic	• Slowing movement down
• Travel time minimisation	• Reasonable travel times and travel time reliability
• Segregation of people and traffic	• Integration of people and traffic

Source: Adapted from Marshall (2001) (Table 1).

Neighbourhood livability

Compared with sustainability, which is more concerned about the future, livability is more concerned with "now". Sustainability focus on long-term and has a broader global perspective, while livability focus on human and social factors for a certain group at a certain time (Abdel et al, 2010).[important to distinguish sustainability and livability] There is no universally accepted definition of livability and it covers a wide range of areas, emphasizing that whether or not a place is suitable for people to live, work, and stay in it.[general definition of livability] It is a qualitative measure of individual perception rather than a quantitative measure of spatial qualities. It refers to the individual perception and cognition of the environment, where people associate certain positive qualities to physical attributes such as traffic, comfort in outdoor space, places to walk and sound ecology - an integration of human activities with the forces of nature (Bosselmann, 2008).

Table 2 from Dalia (2023) summarizes some of the most recognizable approaches to measuring livability. It summarizes the various methods and indices used to assess and rank the livability of cities and communities. These methods have different purposes and use different dimensions or indicators. Table 3 from Maden (2018) shows some general indicators of urban space for livability, including accessibility, comfort, using quality and sociability.

As another key topic that arises in this project is mobility, so the discussion of livability in this project will also be combined with mobility, focusing on the aspects of neighbourhood livability that are affected by mobility. Livability and mobility will emerge as two theories on the same level, and transportation will not be merged as part of livability. Neither of them will be part of the other. With the car invasion in the modern era, vehicles became the main mean of transportation which affected cities tremendously. In late 1950s and early 1960s a growing body of research investigated how motor vehicle traffic transformed cities —air quality, noise, congestions etc., and the impact of such transformations on city residents — health, safety, physical activity etc (Dalia&Tamer 2023). In recent years, urban planners and researchers have become interested in investigating the term urban livability. A number of studies are considering the impact of shifts in transportation development patterns on urban livability (e.g., vitality, quality of life).

The subjectivity of this concept results in the need for a strong emphasis on locality when discussing its content. It is therefore important to emphasize the urban context of Guangzhou, specific to the lifestyles of residents in Renmin road viaduct neighborhood.

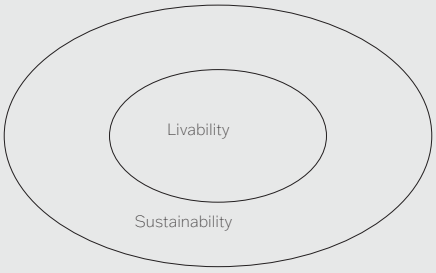


Figure 2.14: Schematic relation between sustainability and livability. Source: University of Wisconsin Transportation *Analysis Team, 2011, as cited in Shamsuddin et al., 2012*

	APPROACH	OBJECTIVE	DIMENSION/INDICATOR
City Ranking on Livability Degree	Economist Intelligence Unit's livability Ranking (EIU)	Ranks 140 cities yearly based on their livability.	Stability, healthcare, culture, environment, education, infrastructure.
	Mercer Quality of Living Survey	Assess living quality in 460 cities, to help organizations to decide their offices locations & workers wages.	39 criteria including: safety, education, health care, culture, environment, recreation, political-economic stability, public transport and access to services.
	Most Livable Cities Index	An annual list that present the top 20 worldwide praised cities.	Safety, economic aspects, connectivity, urban quality, architectural quality, climate, tolerance, public transport, environmental aspects, healthcare.
City Ranking Using Quality of Life	EU Urban Audit	Collect comparable data on European cities to help improve the quality of life.	Demography, Social aspect, Economically aspect, Education and training, Environment, transport, Culture and recreation, Tourism
	United Nations Human Development Index	Assess countries development based on people not economic growth alone.	Long and healthy life, being knowledgeable and have a decent standard of living.
	Global Finance's World's Best Cities to Live	Provides specific livability ranking for American cities.	Economic strength, research and development, health, interaction, culture, accessibility, livability, environment.
	Australian Unity Well-being Index	Measures personal well-being	Community inclusion, safety, the standard of living, and health
	The national well-being	Measures well-being	Environment state, national security, social conditions, and business
	OECD Better Life Index	Allows citizens to compare lives across 34 countries, based on 11 dimensions	Housing, environment, governance, income, jobs, community, education, health, life satisfaction, safety, work-life balance
Neighborhood	Project for Public Spaces PPS Livability Index	People judge if place of a small area around where they live or work is a living space or not.	Access & linkage, Comfort & image, Uses & activities, Sociability.
	American Association of Retired Persons AARP	Assess the environment of a neighborhood through asking people.	Housing, Transportation, Neighborhood features, Environment, Health, Opportunity, Civic & social engagement.

Table 2. Approaches to measuring urban livability

LIVABILITY INDICATORS FOR URBAN SPACES	ACCESS & LINKAGE	Continuity	A1 There is no visual obstacles in the space.
		Proximity	A2 A good connection between spaces and adjacent bldgs
			A3 Public Transportation nodes are in a walking distance.
		Connected	A4 Occupants of adjacent buildings use the open space.
			A5 Spaces are well connected with the pedestrian network.
		Readable	A6 People can easily walk to the place.
		Walkable	A7 Sidewalks lead to and from the adjacent areas
		Convenient	A8 Spaces function for people with special needs, elderly & children
			A9 The roads take people where they actually want to go
			A10 Space has enough cycling parking.
		Accessible	A11 People can use a variety of transportation options
			A12 Transit stops are conveniently located next to destinations
			A13 There are enough traffic lights.
	COMFORT & IMAGE	Historic	B1 The place is surrounded by heritage buildings and context.
		Attractive	B2 The place makes a good first impression.
		Charming	B3 There are many photo opportunities available
		Spiritual	B4 The surrounding building conditions are good.
		Sittable	B5 There are enough seats conveniently located
		Walkable	B6 Space is dominated by pedestrian use
		Green	B7 The space has enough green areas.
		Clean	B8 Spaces are clean and free of litter.
		Safe	B9 The area feels safe
			B10 There are more women than men
			B11 The space is well illuminated during night.
	USES & ACTIVITIES	Fun & Active	C1 The place is full of people using the space
		Vital	C2 The place is used by people of different ages
			C3 People are present in groups in the place
		Variant	C4 There are many different types of activities occurring
			C5 Space activities are suitable for different times daily & weekly
		Dense	C6 The activities in the space are within proper density.
	SOCIABILITY	Welcoming	D1 This a place where you would choose to meet your friends
		Interactive	D2 People are present in groups and are talking with one another
		Friendly	D3 People seem to know each other by face or by name.
		Pride	D4 People bring their friends and relatives to see the place.
		Neighbourly	D5 People are smiling & make eye contact with each other
		Cooperative	D6 People use the place regularly and by choice
		Stewardship	D7 People tend to pick up litter when they see it
		Diverse	D8 A mix of ages and ethnic groups reflects the community

Table 3. Field survey indicators. Source researchers adopted from Maden K

03

PROBLEM FIELD

Problem Field
CONVENTIONAL MOBILITY MODE

Conventional, mobility-based planning places automobiles at the center of the transport system. The new, accessibility-based paradigm places people at the center (Litman,2012). Conventional transport analysis is based on the premise that travel is a cost, and that travel times should be as short as possible (Banister, 2007). The conventional approaches primarily focuses on physical dimensions and mobility, emphasizing traffic, particularly for cars. It tends to be large in scale, viewing streets mainly as roads for motorized transport. This approach involves forecasting traffic, utilizing modeling approaches, and conducting economic evaluations, treating travel as a derived demand. It is demand-based, aiming to speed up traffic and minimize travel time, often resulting in the segregation of people and traffic.(Table 1,from Marshall 2001).

Under this mindset, transport planning primarily includes large-scale construction of highways and ring roads, wide multi-lane streets, ample parking facilities, low-density suburban development, and clear single-use zoning. In the short term, it can significantly improve traffic efficiency, support economic growth, and provide great convenience for drivers. However, in the long term, this model leads to severe traffic congestion and environmental pollution, low land use efficiency, social isolation, and a weakened public transportation system.

Over the past decade, many Chinese cities have adopted a traditional western approach in responding to mounting problems of traffic congestion, airborne pollutants, rising accident rates, and other ills associated with automobile-oriented societies. This has been one of mainly technological and supply-side solutions, in the form of super-freeways and viaducts, expansive roadway capacity, intelligent transportation systems (ITS), and other technical exigencies that seek to accommodate pressures wrought by rapid motorization (Cervero,2006 . The Renmin Road Viaduct is a typical traditional Western approach. As we have learned from the history of viaduct development mentioned above, the Renmin Road Viaduct was an emergency solution to the problem of traffic congestion at the time, and was built from planning to construction within a year.

This planning approach represents a classic example of prioritizing short-term economic benefits. At the time, the primary focus was on alleviating traffic congestion, without considering the complex commercial characteristics of the area. In traffic organization, the composition of pedestrian and vehicle flows, along with the purpose of traffic, determines commercial value. The relationship between commerce and traffic is influenced by shopping time and dwell time. Developed modern transportation methods, including expressways and viaducts, tend to be more destructive than cohesive for traditional commercial districts Huang,2008.Most businesses in this district operate on a retail model, requiring good accessibility and a high volume of foot traffic, rather than an influx of cars. Evaluating the accessibility of a commercial district should include an analysis of the quality of walking, cycling, automobile, public transit, taxi service, and parking conditions (Litman, 2012).

Additionally, these businesses rely heavily on efficient logistics. The presence of the viaduct has hindered the ease of transportation for logistics vehicles, and the lack of a systematic logistics roadway often results in workers pulling carts alongside private cars on the streets, creating chaotic conditions. Initially, this area was the commercial hub of Guangzhou, and despite the chaotic traffic and low accessibility, consumer activity remained robust. However, over time, as the city's traffic focus shifted, the negative impacts of the viaduct on the adjacent commercial streets became increasingly evident. The viaduct not only obstructed logistical operations but also failed to accommodate the evolving urban dynamics, gradually diminishing the area's commercial vitality.

Heavy vehicular traffic system

Incomplete non-motorized transportation systems

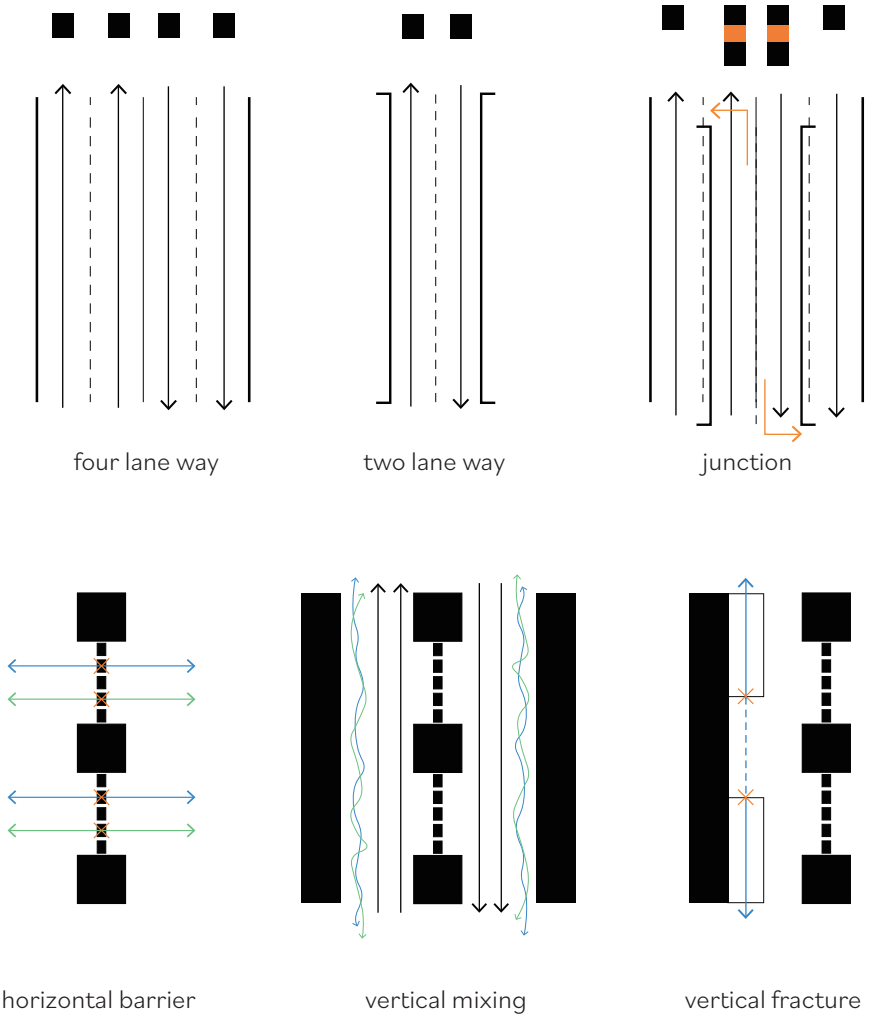


Figure 3.1:Analysis of Current Traffic Patterns, made by author

Problem Field
CONVENTIONAL MOBILITY MODE

Besides, the traffic planning in this area has ignored the needs of the people, focusing solely on speeding up traffic. The roads have been excessively widened, with six lanes spanning about 10 meters, yet there are no complete sidewalks and only intermittent bicycle lanes of just 0.5 meters. This, combined with the viaduct carrying two lanes of high-speed traffic and incomplete non-motorized pathways, severely affects the safety and convenience of travel for residents living nearby. In reality, there is a significant amount of non-motorized traffic in this area, leading to frequent occurrences of pedestrians crossing barriers under the viaduct and numerous bicycles and electric scooters occupying vehicle lanes.

In rapidly growing settings, experiences have shown time and again that road widenings and supply-side solutions only provide short-term congestion relief. Due to behavioral shifts (in mode, routes, and time-of-day) and structural adjustments (including land-use shifts), newly expanded capacity quickly gets consumed (Cervero, 2006). This situation is clearly evident here, where the focus on road expansion has not addressed the underlying transportation needs of the community, resulting in persistent congestion and unsafe conditions for non-motorized users.

From the perspective of urban aesthetics, this traditional traffic model also leads to the segregation of culture. The rich historical landscapes in this area could have endowed the district with a unique cultural character. However, the unreasonable traffic planning has failed to integrate with these cultural landscapes to promote cultural tourism. Instead, it has brought significant noise, exhaust fumes, and heavy traffic. The viaduct facilitates car mobility while neglecting the tourist mobility. The negative impact of the urban viaduct, built to improve road traffic efficiency, on the vitality and character of the old town has become increasingly prominent. The presence of the viaduct is difficult to harmonize with the architectural styles along its route, deterring tourists from visiting (Di, 2022).
Additionally, the heavy vehicle traffic generates considerable noise and air pollution, which make the conventional mobility environmentally harmful.

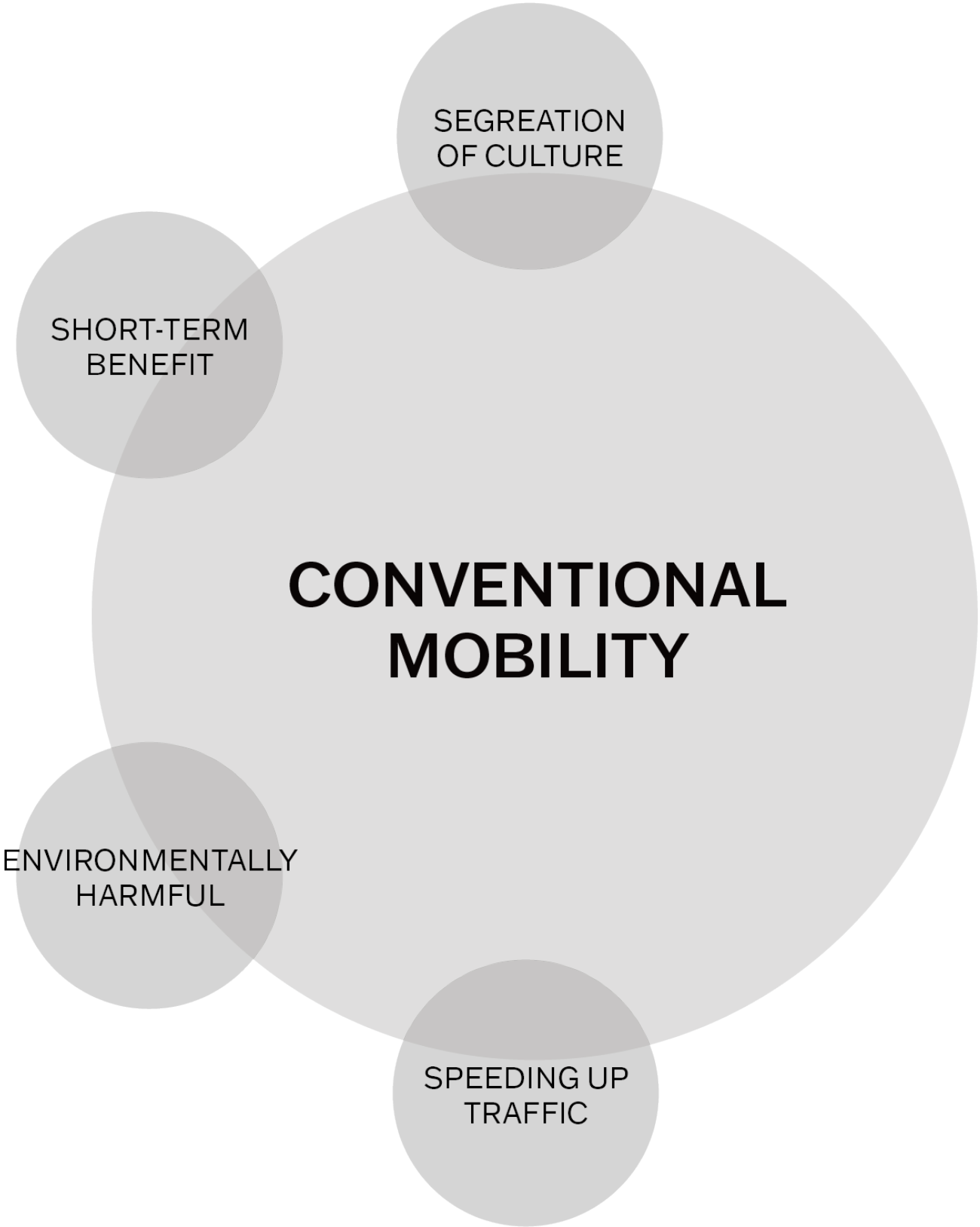
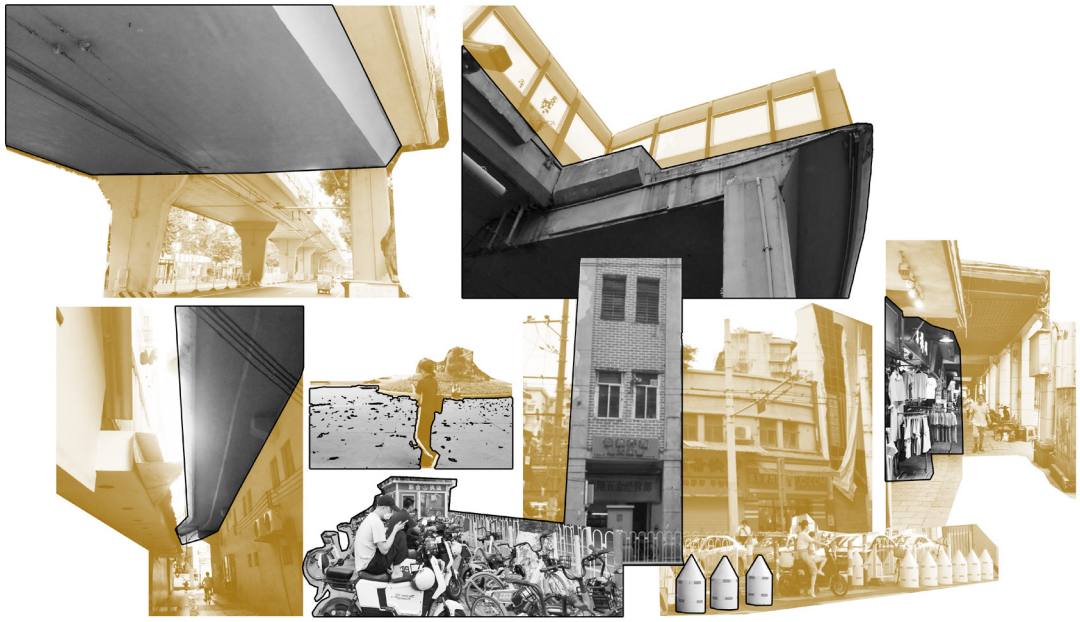


Figure 3.2: Four Problems with Traditional Transportation Models, made by author

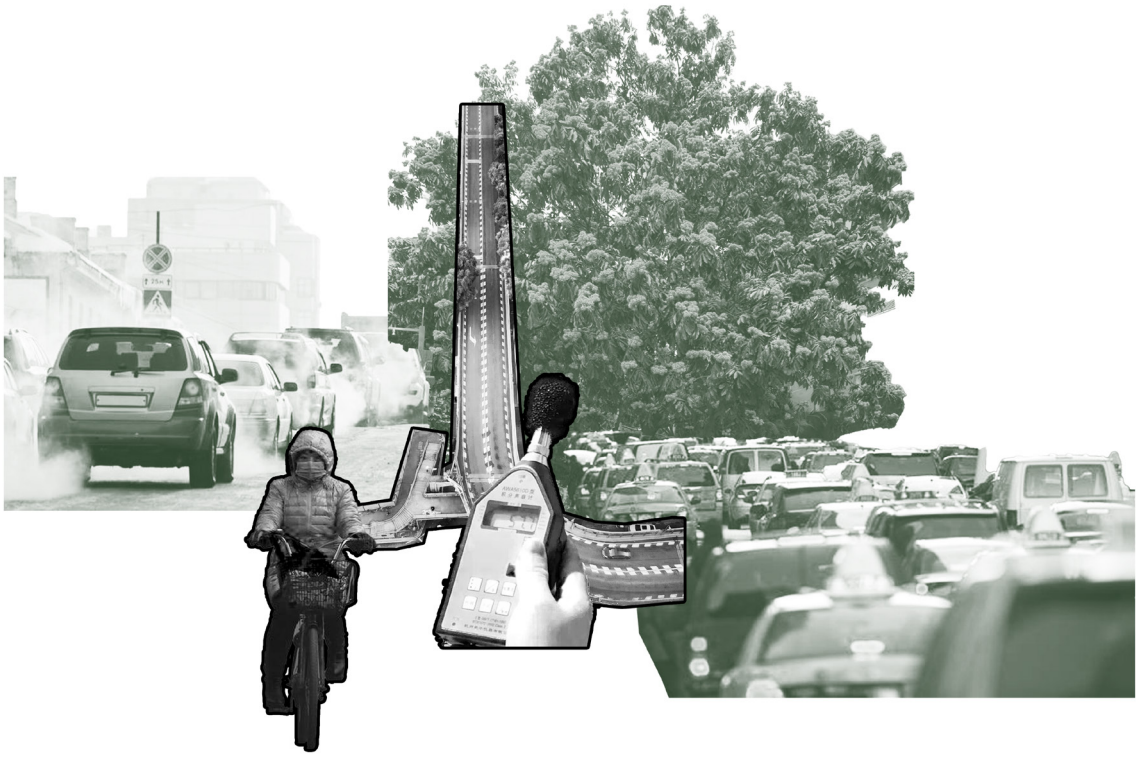
Problem Field

LOW LIVABILITY NEIGHBOURHOOD

Low open space quality



High environmental pollution



Commercial decline

Destruction of cultural history

Figure 3.3-6: Four Livability Problems collage, made by author

At the same time, the presence of the Renmin Road Viaduct has significantly lowered the quality of life for the residents. As discussed in the previous explanation of community livability, visible aspects such as accessibility, environmental quality, public space quality, commercial vitality, as well as invisible aspects like community culture, inclusiveness, and a sense of belonging, all fall under the broad concept of livability. In the discussion of livability issues concerning the Renmin Road Viaduct community, specific aspects disrupted by the viaduct will be highlighted. These observations will be based on the author's personal observations and literature review.

Destruction of cultural history

The massive structures of viaducts change the skyline and landscape of the city, thus affecting the original cultural atmosphere. Some historical buildings, landmarks or urban features may be altered or obscured during the construction of viaducts, thus affecting the cultural image of the city. The construction of viaducts poses a threat to the surrounding historical buildings. Building viaducts in historic districts often results in structures that are incompatible in scale and size, causing the original historical charm of the neighborhood to be lost. Demolishing important historical buildings to construct urban viaducts, thereby damaging the historical and cultural landscapes and disrupting the living atmosphere of historic districts, is ultimately a counterproductive approach(Liang&Chen,2017).

If the construction of the bridge is not properly planned, the structural stability of the historic buildings may be jeopardized or even at risk of demolition. Viaducts create physical barriers, which may result in reduced communication between communities and limited cultural transmission and exchange. If the viaduct passes through historic districts, it may change the original pattern and appearance of these districts. The cultural characteristics and historical value of the historic district may be damaged. Culturally, the essence is that the urban planning of the area does not protect the historical buildings, but at the same time, the viaduct also destroys the texture of the area and the historical value is not utilized.

Commercial decline

"The arrival of the viaduct made the decline of the business district inevitable."

A community's commercial vitality is also an important aspect of livability. Urban livability has been defined by climatic conditions and ecological environment changes of a region or a city (Brink et al., 2016; Sanchez et al., 2018) and the social welfare or income gap of the local residents (Okulicz-Kozaryn, 2011; Ouyang et al., 2017). A commercially vibrant community provides numerous employment opportunities, promotes local economic development, and increases residents' income and social security. Active commercial districts are often gathering and socializing places for community residents, helping to enhance community cohesion and interactions among residents. Additionally, commercial zones in a city represent deeply rooted traditions, supported by long-term consumer behavior and habits, which are difficult to replicate(Huang,2008).

The area around Shisanhang on Renmin South Road, once formed the bustling commercial heart of Guangzhou together with the foreign merchants' docks and the Changdi area. The Renmin South Road and the entirety of Renmin Road in the Shisanhang ruins area hold a special historical significance (Huang, 2008). The Renmin Road commercial district in Guangzhou was once the city's most prosperous commercial and financial center. However, after the viaduct was constructed, its wide structure overshadowed the arcade streets, reducing natural light and creating a gloomy, oppressive atmosphere. This led to a sharp decline in business and stifled the urban vitality (Liang & Chen, 2017).

The viaduct's construction altered the city's traffic patterns, reducing accessibility to the original commercial area and thereby diminishing its attractiveness and convenience for residents. As businesses lost their customer base due to transportation inconveniences, the vibrancy and economic health of the community deteriorated, directly impacting residents' quality of life. The increase in vehicular traffic and decrease in pedestrian shoppers disrupted the local economy, leading to the decline of retail services and a shift towards wholesale, which lacks the community engagement and accessibility essential for a livable neighborhood. In summary, the construction of the viaduct not only changed traffic patterns but also adversely affected the economic, social, and environmental aspects of the community, ultimately undermining its livability.

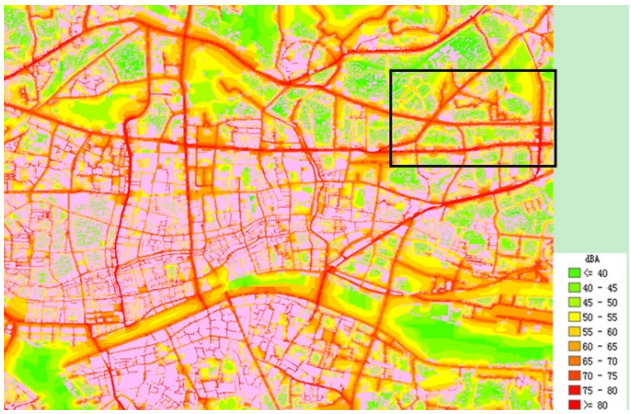


Figure 3.7: Guangzhou Traffic Noise Map
(Traffic Noise Research Team, Intelligent Transportation Center, College of Engineering, Sun Yat-sen University, China)

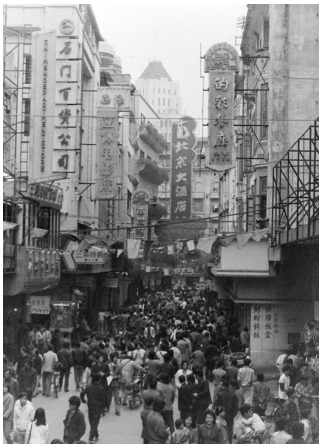


Figure 3.8: South Renmin Road in the 1930s,
Guangzhou Municipal Planning Institute (GZPI)

Figure 3.9:South Renmin Road now,
Guangzhou Literature and History Website

Environmental pollution

In terms of the ecological environment's impact on community livability, the viaduct has exacerbated noise and exhaust pollution in the area. The Renmin Road Viaduct is located in a densely populated central urban district. Due to the noise source being elevated, the noise spreads more easily and loudly to the surrounding areas, with shorter distances to nearby buildings.

The government has implemented measures to address such pollution, such as installing soundproof barriers on both sides of the viaduct and using double-layer soundproof windows in residential buildings to achieve sound insulation and ventilation. However, these measures have proven to be quite limited in their effectiveness. Residents on both sides of the viaduct have long endured noise and dust pollution. Additionally, the negative impacts of noise and dust have led to decreased land values and property devaluation along the viaduct's route (Huang, 2008). Setting up noise barriers can only partially reduce the noise impact, while also introducing the new problem of reduced natural light. Unlike ground-level roads, where plants along the roadside can filter exhaust fumes, the exhaust emissions from cars on the viaduct disperse more easily into the air, worsening pollution. Residents and workers near the viaduct suffer from the combined effects of noise and exhaust pollution, which negatively impacts their well-being (Liang & Chen, 2017).

Low open space quality

Open space has two main categories in my project: larger, more open spaces, including public squares, parks, gardens, etc., which provide venues for people to engage in a variety of activities, and linear street spaces, which focus on passage and at the same time enable people to stay.

The Renmin Road Viaduct has significantly compromised the quality of these open spaces, thereby reducing the overall livability of the area. Firstly, the viaduct occupies the original street space, casting large shadows that block sunlight and disrupt sightlines, effectively fragmenting the once cohesive street landscape. Its massive structure, stretching for kilometers with wide lanes and bulky pillars, creates physical barriers that divide the urban space, making it disjointed and fractured. The construction of the viaduct also involved the large-scale demolition of old buildings, leading to the loss of organically integrated physical spaces. This often results in a stark contrast between the new and old spatial forms, erasing the unique spatial characteristics and diminishing the city's recognizable image (Liang & Chen, 2017; Yang, 2015).

Additionally, the space beneath the viaduct tends to become areas for litter and grime. These underpasses are difficult to utilize effectively and, due to safety concerns, cannot support buildings. Consequently, they are often relegated to functions like parking lots, bus stations, or waste transfer stations, and frequently become shelters for the "urban fringe population" or even serve as "temporary toilets." This significantly degrades the quality of public spaces in the community.

Finally, the presence of the viaduct reduces accessibility to public spaces, further diminishing their usage. The fractured open spaces and poor-quality public areas caused by the viaduct's existence make the neighborhood less livable and adversely impact the residents' quality of life.

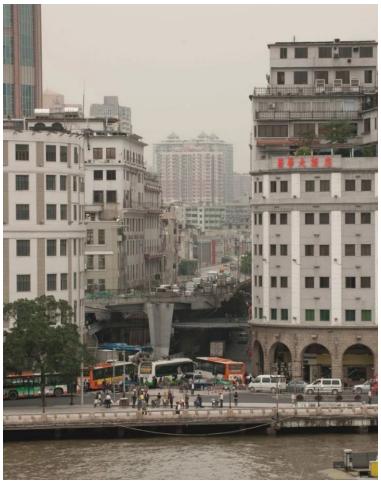


Figure 3.10:South Renmin Road in the 1930s, Guangzhou Municipal Planning Institute (GZPI)

Figure 3.11: Guangzhou Traffic Noise Map (Traffic Noise Research Team, Intelligent Transportation Center, College of Engineering, Sun Yat-sen University, China)

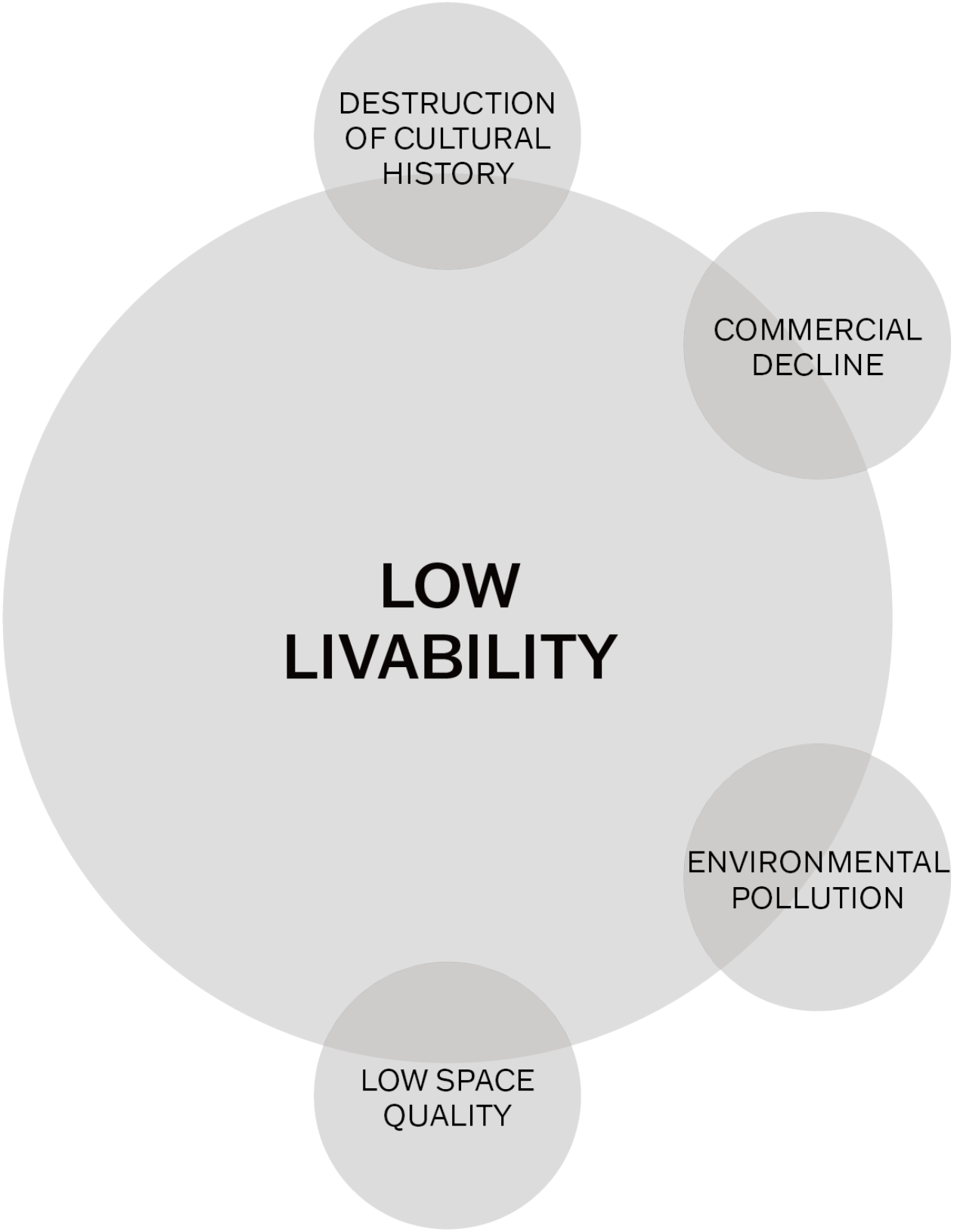


Figure 3.12: Four Problems with Low livability, made by author

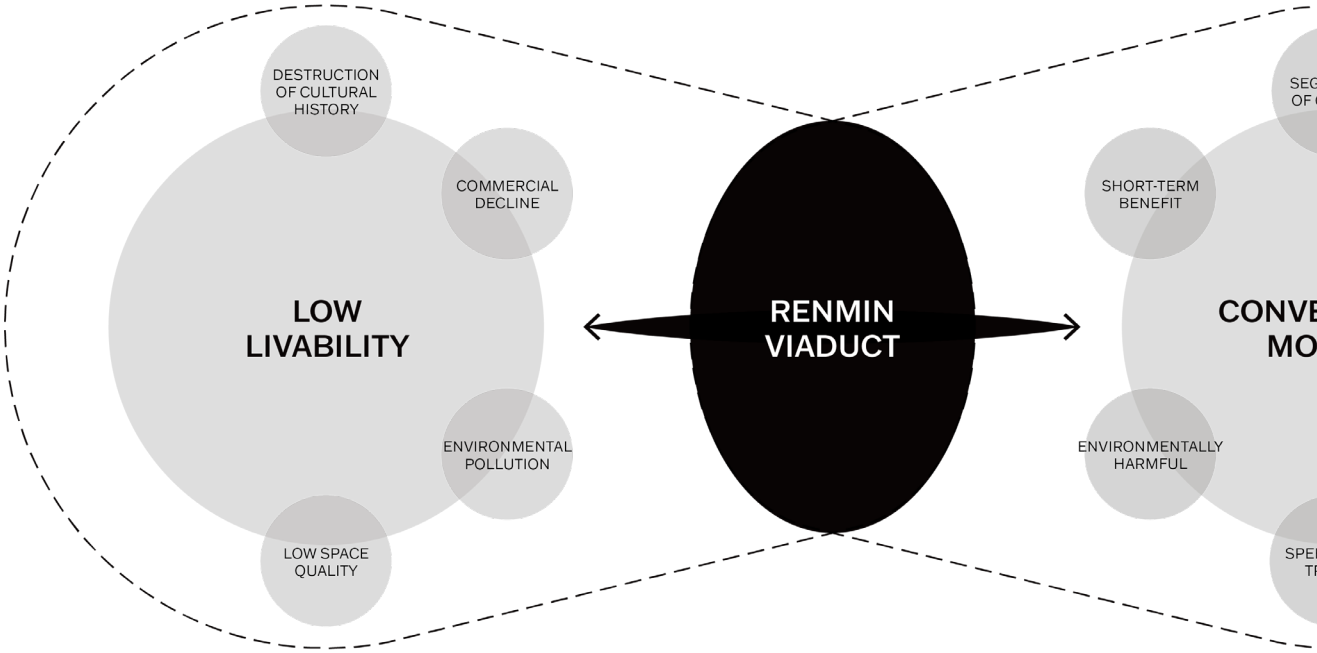
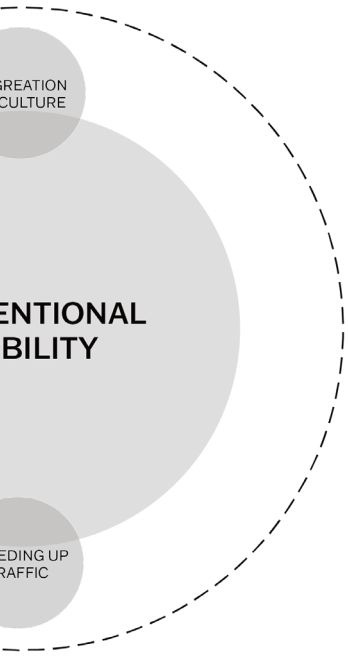


Figure 3.13: Problem statement, made by author

Problem Field

PROBLEM STATEMENT



The construction of the Renmin Viaduct has resulted in two major issues: the drawbacks of conventional mobility which leads to an unsustainable future and a low neighbourhood livability.

The viaduct has caused the destruction of cultural history by disrupting the cultural landscape, erasing the historical charm of the area. It has also contributed to commercial decline, as reduced accessibility and overshadowing by the viaduct have led to a decrease in foot traffic, causing a decline in business and commercial vitality. Additionally, environmental pollution has increased, with heightened noise and air pollution significantly impacting the health and well-being of nearby residents. The viaduct has also degraded space quality by fragmenting urban areas, creating dark, oppressive spaces that are difficult to utilize effectively.

Furthermore, conventional traffic planning focused on short-term benefits, prioritizing immediate traffic alleviation while overlooking long-term impacts on urban development and community needs. This approach has resulted in the segregation of culture and diminishing the sense of community. It has been environmentally harmful, encouraging reliance on cars for travel, leading to increased emissions. Finally, the emphasis on speeding up traffic flow has led to the neglect of pedestrian and cyclist needs. This traditional traffic planning model is becoming increasingly unsustainable in the context of rapid urbanization.

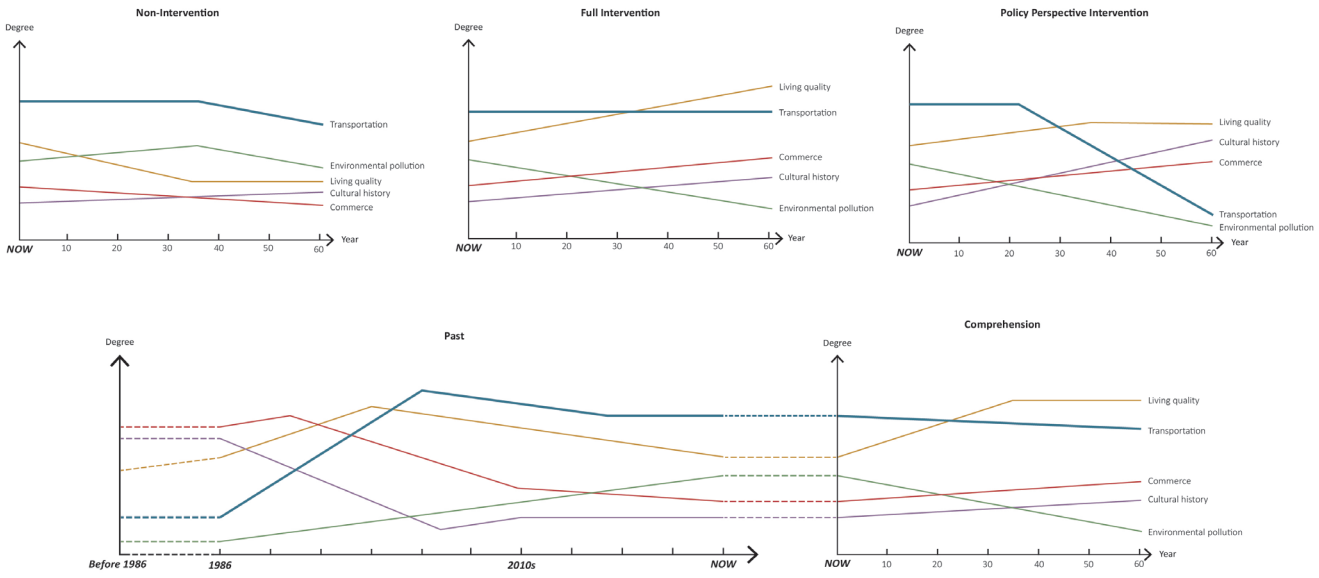


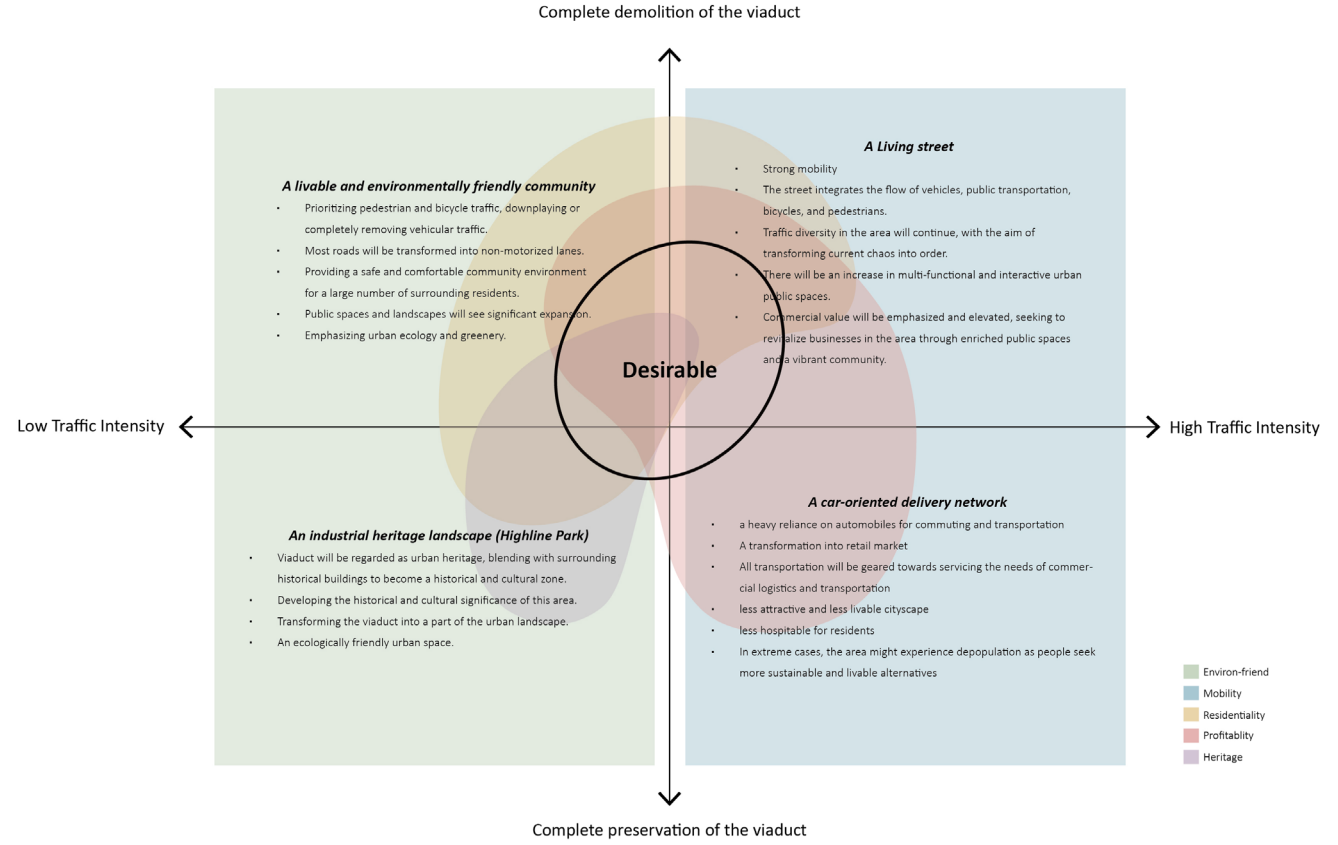
Figure 3.14: future trend, made by author

After outlining my research background, the future trends in transportation development, and the current issues, I have preliminarily explored my research direction through scenario. Scenarios represent possible developments from the present to a described future image. They can be described as stories about the future, possessing a strong narrative character even if they employ quantitative methods. In planning theory, scenarios are generally defined as plausible, vivid stories about possible future states(Salewski, 2010).

The scenario diagram illustrates four potential future developments for the Renmin Viaduct area, categorized by traffic intensity and the extent of viaduct preservation or demolition. It highlights a range of outcomes from a car-oriented delivery network to a livable and environmentally friendly community. The desirable scenario involves partial demolition and reconstruction of the viaduct.

Through the analysis of four scenario dimensions, I have identified the direction for my research:
The highly advanced transportation technology will be integrated into most areas of Guangzhou, making public transportation the mainstream. Additionally, smart transportation and autonomous driving technologies will enhance the overall orderliness of urban traffic. This elevated bridge will no longer bear the burden of such heavy automobile traffic.
Therefore, for the elevated bridge itself, it will undergo partial dismantling and reconstruction. The preserved sections will still serve transportation functions, but exclusively for pedestrian use.
Beneath the elevated bridge, there will still be a high volume of traffic, but public transportation, smart traffic management, and autonomous driving will replace the current reliance on private vehicles, mitigating potential congestion issues resulting from the bridge's reconstruction.
As for the neighborhoods on either side of the elevated bridge, through the comprehensive transformation of the bridge itself and the surrounding space, the environmental quality and public space will experience improvement. A vibrant living environment will once again attract people, leading to the revitalization of commercial value in the area. Additionally, the partially renovated structure of the elevated bridge will be preserved as an urban industrial heritage in this area, contributing to the overall vitality of the space.

Problem Field
SCENARIO



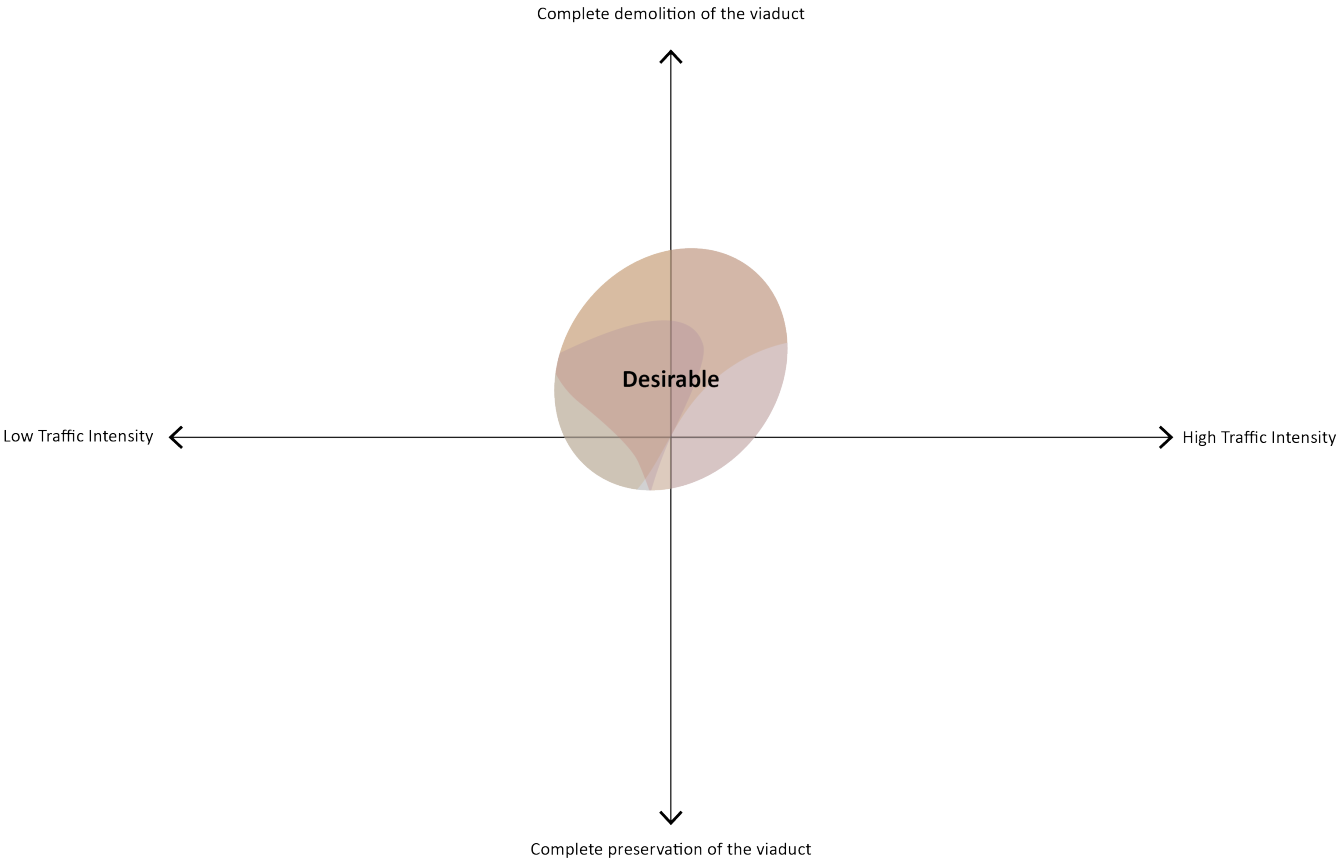


Figure 3.15: 4 dimension scenario, made by author

04

METHODOLOGY

Methodology
RESEARCH FRAMEWORK

As an urban designer, design with research has almost run through my entire work history. The research framework section mainly summarizes the research methods of this project and how different research methods and design methods are involved in the project process. The fig.1 Design process illustrates a relationship between research (evidence) and creativity (imagination) in the design process. It suggests a rhythmic oscillation between the two elements, emphasizing how they interact and inform one another throughout a design project.

At the beginning of the design process, imagination peaks, signifying a phase where creative ideas are most fluid and abundant. While digging deeper, evidence starts to shape and inform these ideas, resulting in a period where rigorous research dominates and imagination takes a backseat, leading to more grounded and practical solutions.

The fig.2 illustrates a non-linear, iterative design flow that starts with an assignment and progresses through analysis, concept, and various stages of modeling before reaching a final design. It emphasizes the dynamic nature of the design process, with multiple feedback loops between different stages, especially in the modeling phase (M1 through M4), where ideas are tested and refined. So for an urban designer, even after reaching a "final" design, there's still an ongoing relationship between the design and its context, possibly leading to further revisions and iterations.'

Fig.4.1 Design process (from Claudiu Forgaci & Birgit Hausleitner)

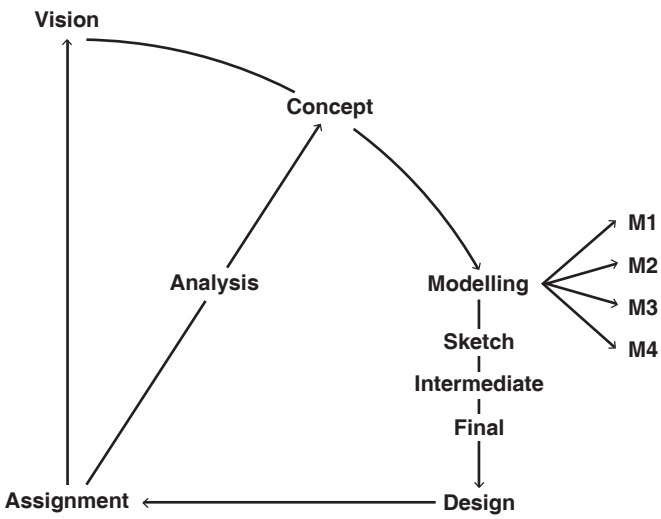


Fig.4.2 usual design process (from Marco Lub)

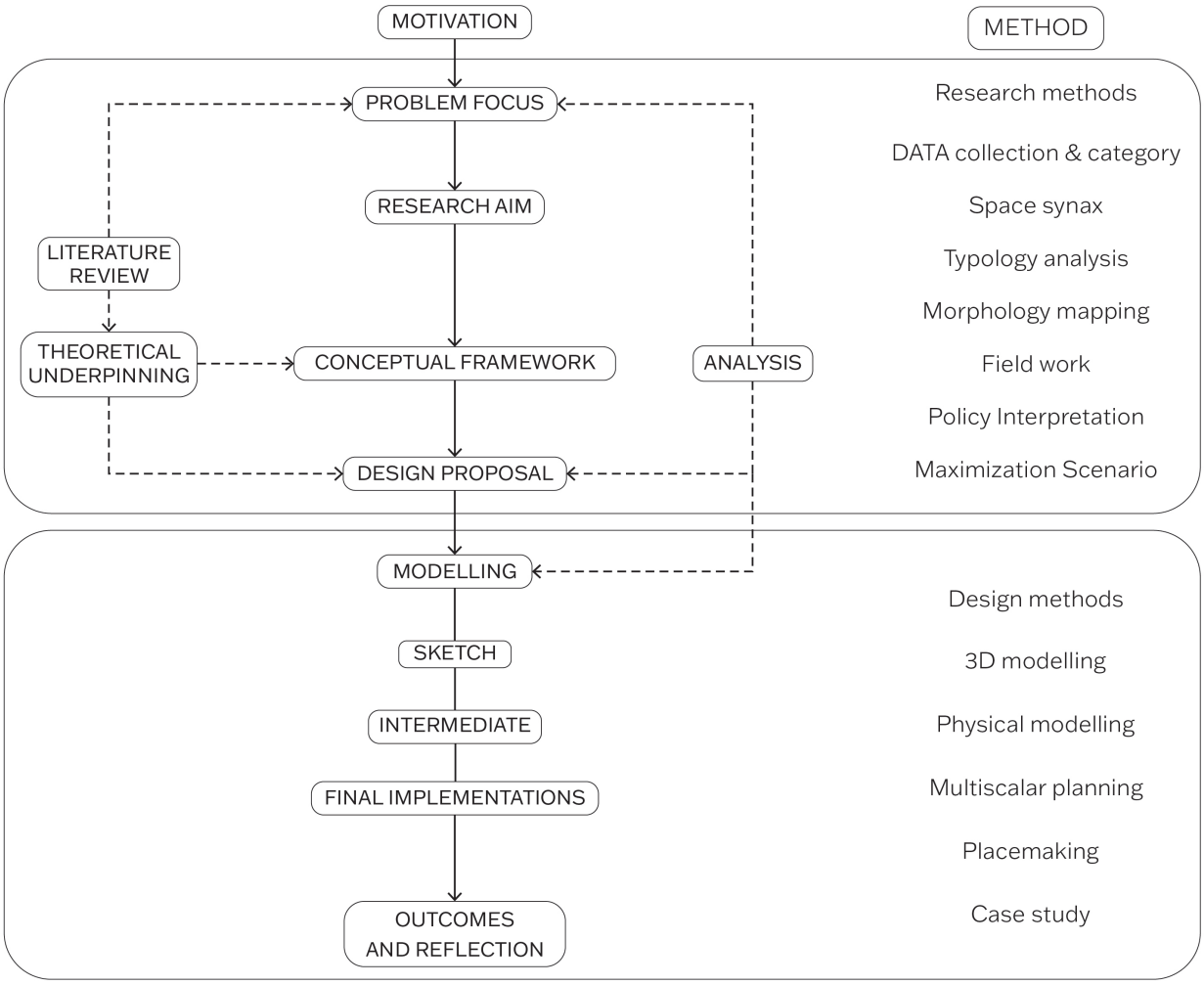


Fig.4.3 My project research framework, made by author

These two diagrams are a good summary of the research process of this project. Combining them with my own research process, I translated the research framework of this project.

Motivation is the driving force behind the project. It sets the stage and provides the initial impetus for the research and design effort. Problem Focus defining the core problem that the design aims to address. This stage is informed by the initial motivation and directs the research aim. Research Aim refers to the specific goals, guiding what needs to be investigated to inform the design process. Conceptual framework conclude research findings into a coherent framework that will guide the design process. And then it comes to the design process.

Literature review and theoretical underpinning as the main theoretical parts study existing texts to understand the knowledge related to the problem and to identify gaps that the current project might address. Then developing a theoretical base for the project, which could influence the conceptual framework and support the design proposal. The analysis part is also independent of the entire workflow and will serve as a reference to facilitate the exploration and design of research questions. Method is devided into research and design ones. They will be used as tools in different parts.

This reflects the iterative nature of design, emphasizing that it is a dynamic process with constant interplay between research, theory, and creative practice.

Methodology

RESEARCH AIM&QUESTION

How can we achieve a sustainable mobility transformation by integrated infrastructure, while simultaneously improving the neighbourhood livability to regenerate the Renmin Viaduct area in Guangzhou?

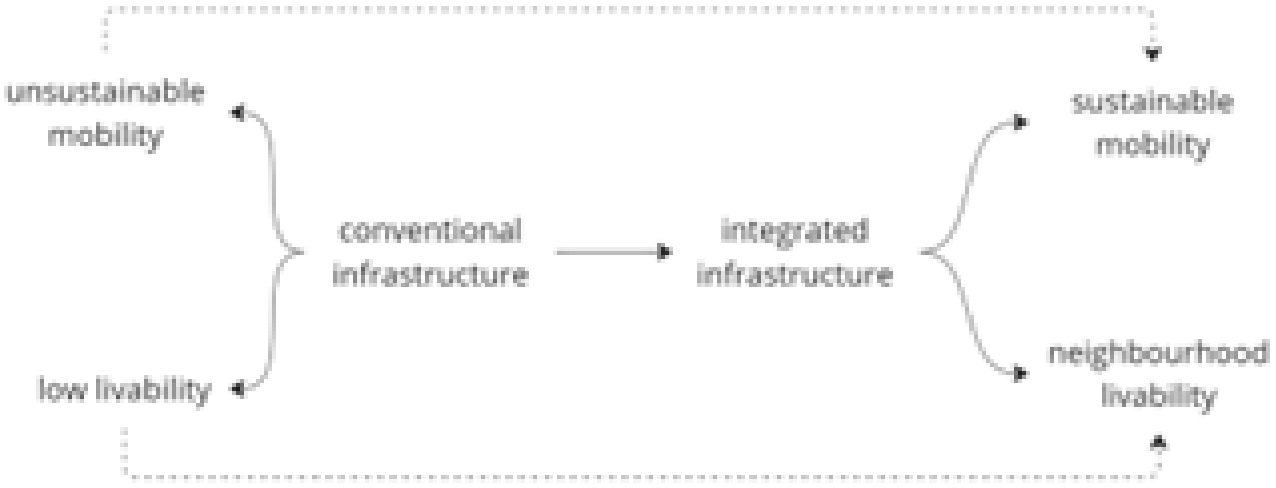


Fig.4.4 research aim, made by author

This project aims to repurpose the Renmin Viaduct to regenerate the neighborhood. It will serve as a catalyst for the revitalization of the surrounding neighborhood, transforming from a negative urban element into a positive engine for development. As a key factor contributing to the issues in this area, it will be changed from a singular infrastructure to an integrated infrastructure. By redesigning the viaduct, mobility and livability of the neighborhood on both sides of the Renmin viaduct will be improved simultaneously, including retailed commercial revitalization, better open space, preservation of heritage, and greenery improvement.

Methodology
THEORETICAL UNDERPINNING

Introduction

In this project, the theories chosen are divided into definitions involved in explaining the final design goals and the design theories needed to achieve it. The concepts related to the project will be further clarified.

The theoretical research process for the project was divided into five steps. Firstly, the background of the problem and identifying the root cause of the problem, and then the explanation of the design goals, the major theories for achieving the design goals, the design principles for further refinement, and the judgment of whether the final design result meets the goals set in the initial stage.

The project presents a hypothesis that in the future mobility development of Guangzhou, sustainable transportation must be integrated with livability, with the aim of changing the status quo of transport infrastructure disconnected from the rest of the city.

The problem field section explains the influence on urban human living caused by conventional transportation planning approaches to infrastructure, and points out that integrated infrastructure can serve as a new balance to address the negative consequences of the present. In order to do this, an integrated infrastructure transformation are used in this project to meet the mobility and livability demands of residents.

Unlike the literature review, there will be more policy documents, articles, or other data information related to Guangzhou to help me further deepen the understanding of these three concepts in the context of Guangzhou, and even within the context of my site.

Neighbourhood livability in Renmin viaduct area

As previously mentioned in the literature review section, livability is a concept that places great emphasis on the individual living perception, so the definition of livability must consider local characteristics.

First of all, guangzhou is a typical megacity with large population and prosperous economic industries. According to China Livable Cities Survey Report (CLCSR) in 2017, the livability assessment of a large city is usually based on urban safety, accessibility to public services and facilities, natural environment, social and human environment, and healthcare. [Relatively authoritative indicators]

When zooming in the research to the livability of Renmin Road Viaduct Neighborhood, the main groups of residents in the neighborhood should first be clarified. The age distribution of residents in the area is mainly dominated by young and middle-aged people (about 60%), followed by the elderly (about 25%) and teenagers (less than 15%) (Bulletin of the Seventh National Population Census of Liwan District and Yuexiu District, Guangzhou City, 2022) (Fig.3). Residents' education and income levels are relatively low, and they are mainly engaged in common staff or temporary jobs (data-dance.com, Data on education, occupation and income level of people in Renmin Road neighborhood of Guangzhou City, 2022). This shows that the quality of life here is likely to be low, and they do not overemphasize higher, focusing more on maintaining a basic standard of living. Therefore, in their consideration, the living needs of this group tend to emphasize more on basic, practical and functional needs (Huang, 2022). For example, low-income populations are usually more dependent on public transportation systems, and therefore need to have good transportation and infrastructure in place.
It is also worth noting that in a large, complex city like Guangzhou, low-income and low-educated people often have a greater need for traditional, easy-to-participate, and understandable forms of culture, such as religious ceremonies and festivals and celebrations, to maintain a sense of identity and belonging. For these populations, traditional culture may be an important link to the community and help build social identity. [First conclude the target group and the needs of the group]

To sharpen the focus of urban livability research in this area, firstly, livability will be distinguished in four dimensions: social, environmental, economic, and cultural. Such four dimensions were chosen in reference to sustainability. First of all, these four dimensions are relatively broad and can essentially cover the majority of indicators in livability. Second, based on the research theme of this project, which is how to meet both community livability and transportation sustainability, discussing livability and sustainability through the same four dimensions can make it clearer in the future on how design strategies can achieve both goals. Furthermore, the existing livability factors that are destroyed by the viaduct will be firstly considerated, such as environmental pollution, low-quality open space, cultural heritage breakdown, and economic recession.

And last but not least, as an urbanism project, livability improvements need to start with space. Based on the groups in this neighborhood and their needs mentioned in the previous text, with the consideration of viaduct,

the their needs are broadly divided into four directions, and translated into the spatial level, they will be: at the social level, in order to increase better community interactions, they need more open spaces of higher quality; at the environmental level, in order to cope with the noise and pollution brought about by the traffic, they need larger areas of urban greening; at the economic level, in order to increase their income, they need more attractive commercial spaces for consumption; and finally, at the cultural level, to protect the existing cultural heritage and create cultural spaces to meet the heritage of traditional practices of the community people. At the economic level, to increase their income, they need commercial spaces that are more attractive for consumption; and finally, at the cultural level, to preserve the existing cultural heritage and to create cultural spaces that fulfill the traditional practices of the community people.

Therefore, in this project, the study of neighbourhood livability will be based on these spatial needs and result in a definition: a good neighbourhood livability in Renmin viaduct area means cultural heritage promotion, retailed commerce activation, ecological environment potimization and enhanced resident interaction.

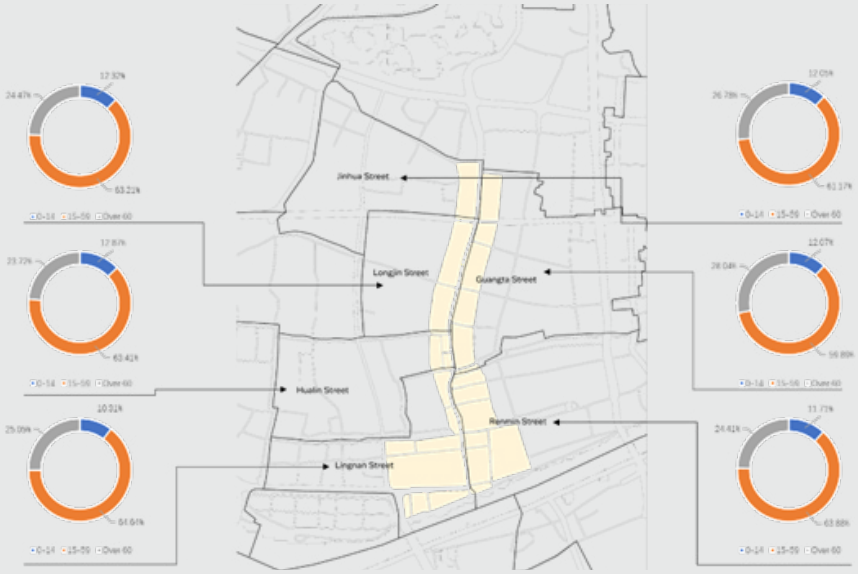


Fig.4.5 Population age distribution

Fig.4.6 Neighbourhood livability goals made by author

Sustainable mobility in Guangzhou

It’s important to discuss the sustainable mobility in the Guangzhou context. According to the 2022 Annual Report on Transportation Development in Guangzhou, a public transportation network with high accessibility has been formed. Green travel (including walking, cycling, e-bicycle, bus and rail transit) remains high, and the use of new energy vehicles is growing rapidly. 3,000 km of multi-level rail transit network has become the basis for the residents' travel, and more than 90% of citizens' commuting time is controlled within 45 min.

In such a development trend, the next sustainable transportation development direction of Guangzhou City will begin to sharpen transportation comfort, except for improving efficiency and reducing carbon emissions (Jing, 2023). Transportation comfort refers to the experience of citizens when traveling, focusing on the development of "complete streets", so that the streets will add other life functions except transportation functions. A much wider notion of the street is being created, as it is no longer only being considered as a road but also as a space for people, green modes and public transport. Creative use of this space at different times of the day or day of the week means also that new uses can be encouraged (e.g. street markets or play zones). Measures to encourage modal shift must be combined with strategies to make the best use of the ‘‘released space’’, so that there is a net reduction in traffic (Banister and Marshall, 2000).

Overall, in the context of Guangzhou's transportation development, the criteria for sustainable mobility no longer focuses solely on the balance between transportation and the environment, but begins to look at transportation as a part of the residents' lives, and how to minimize the adverse impacts on other elements of the residents' lives.

In the site of this project, the current viaduct, as a typical product of traditional transportation planning, was created for such short-term benefits as enhancing the traffic in the area, but after thirty years, it is having increasingly serious impacts on the four aspects of the site: economic, environmental, cultural and social, which is clearly an unsustainable traffic and does not conform to the future traffic orientation of Guangzhou.

Therefore, in order to redesign the transportation in the Renmin Road Viaduct Neighborhood to be sustainable, it is necessary to satisfy the traffic demand while considering the synergy with the economic development, reducing the pollution, not destroying the cultural heritage and improving the atmosphere of culture, as well as achieving a comfort resident travel. Referring to the various types of sustainable transportation practices (Table 1), it is then proposed to present the standards for sustainable mobility in the Renmin Road Viaduct Neighborhood: cultural and tourism oriented, environmentally friendly, collaboration in commerce and pedestrian priority.

Fig.4.7 Sustainable mobility goals made by author

Integrated infrastructure as a catalyst

The Renmin viaduct currently is a conventional infrastructure. In this project it is a major cause of problems in this neighbourhood so it would also be the starting point for solving the problems on the site. The shift from traditional to integrated infrastructure will be the main solution of the project.

Current sustainable transportation planning exercises often endorse building new infrastructure that can support “green,” or greener mobility options. Going beyond adjusting the focus on new infrastructure toward designs that support less carbon-intensive technology, transport planners have rarely considered different uses for existing infrastructure as part of a strategy to advance sustainable mobility. However, it has been mentioned many times before that the realization of sustainable transportation or community livability needs to take into account the economic, social and cultural aspects in addition to the "green" aspects.

Contemporary integrated approaches in infrastructure planning seek to appropriately address the interrelatedness of infrastructure and other land uses within a fragmented institutional context (Graham & Marvin, 2001). Integrated planning involves the consideration of the functional relations between infrastructure and other relevant land uses, as well as the establishment of effective interactions between relevant, but fragmented actors (Forester, 1985; Herder, Bouwmans, Dijkema, & Stikkelman, 2008). Therefore, an integrated infrastructure means besides improving the transportation system, consciously focusing on other interests, such as housing location, recreation activities, and natural environment (Liu et al,2019), addressing the interrelatedness of infrastructure and other land uses to promote social, economic, environmental and cultural development.

Integrated infrastructure not only preserves its original transportation function, but also consciously mixes community development, cultural mission, and economic stimulation. This approach begins by retrofitting the viaduct to address the original problem, and then goes on to further balance transportation with livability as the figure shows.

It is important to emphasize that transforming the viaduct into a integrated infrastructure does not just change the viaduct, but also further impacts the mobility and livability of the neighbourhood on both sides, but it also does not mean that this project is a complete solution to all of the problems of this area through the transformation of one viaduct, it will just serve as a catalyst to drive healthy community development as figure 8. In this project, the vision of sustainable mobility and neighbourhood livability in terms of economic, social, cultural, and environmental aspects can further guide the establishment of design principles for integrated infrastructure.

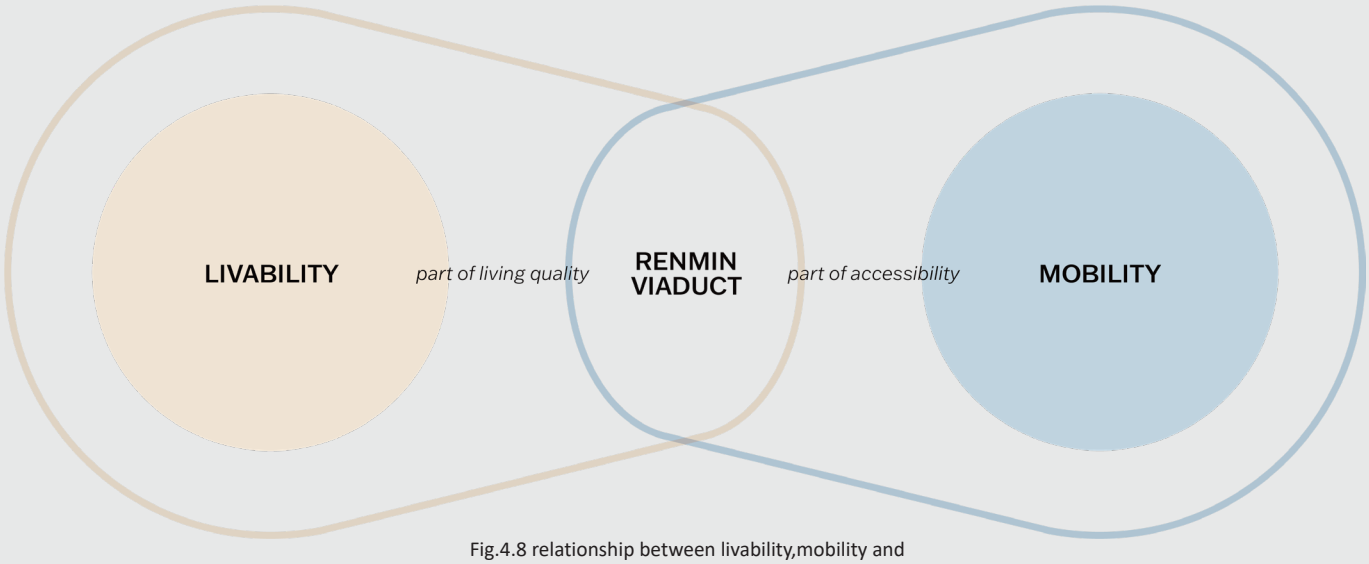


Fig.4.8 relationship between livability,mobility and viaduct, made by author

Approaches for adapting integrated infrastructure

For this project, the integrated transformation of the Renmin viaduct will be based on the following three main design approaches.

Redesign—Converting Infrastructure's Capacity to Support Different Mobility Modes
The San Diego Trolley is a prime example of this approach, repurposing the right of way from the San Diego & Arizona Eastern Railway to support a modern electric light rail transit (LRT) system. By adding new tracks and signals to the pre-existing railway infrastructure, which had been non-operational due to hurricane damage, the city of San Diego was able to expand its urban transit system efficiently.

This redesign initiative allowed for a creative, dual-purpose use of the transportation corridor: the LRT serves commuters during the day and evening, while the existing freight train operations continue in the late night hours. Such temporal reconfiguration is a strategic way to maximize the utility of infrastructure and accommodate different modes of transportation within the same space, effectively supporting mobility needs across various times of the day.

Repurpose—Converting Infrastructure to Alternative Functions
Obsolete infrastructure can be removed entirely, but planners should also explore the option of retaining the infrastructure while having it serve a new purpose to support nontransport functions (Moshe & Anthony, 2017).

Remove—Taking Infrastructure Out of the Space It Previously Occupied
Where the need for mobility is no longer seen as a priority, in comparison with the opportunity to redevelop the space occupied by infrastructure for a higher and better use, the option to remove infrastructure can be pursued. It is better to make a conscious decision to remove the infrastructure (elevated motorway in the case of Seoul) and make space for other land use and activities or keep it in place and renew, redesign, or repurpose it (Moshe & Anthony, 2017).

Methodology

CONCEPTUAL FRAMEWORK

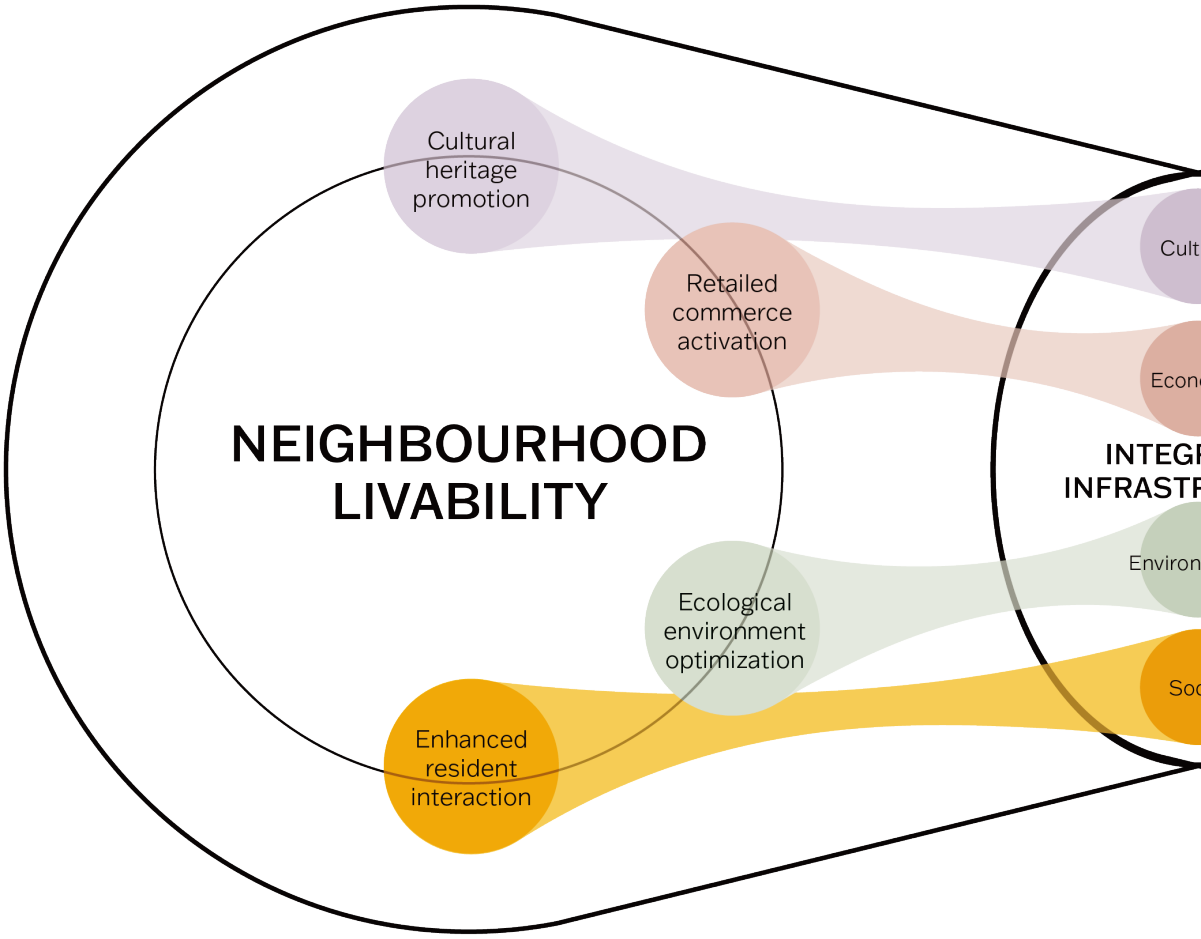
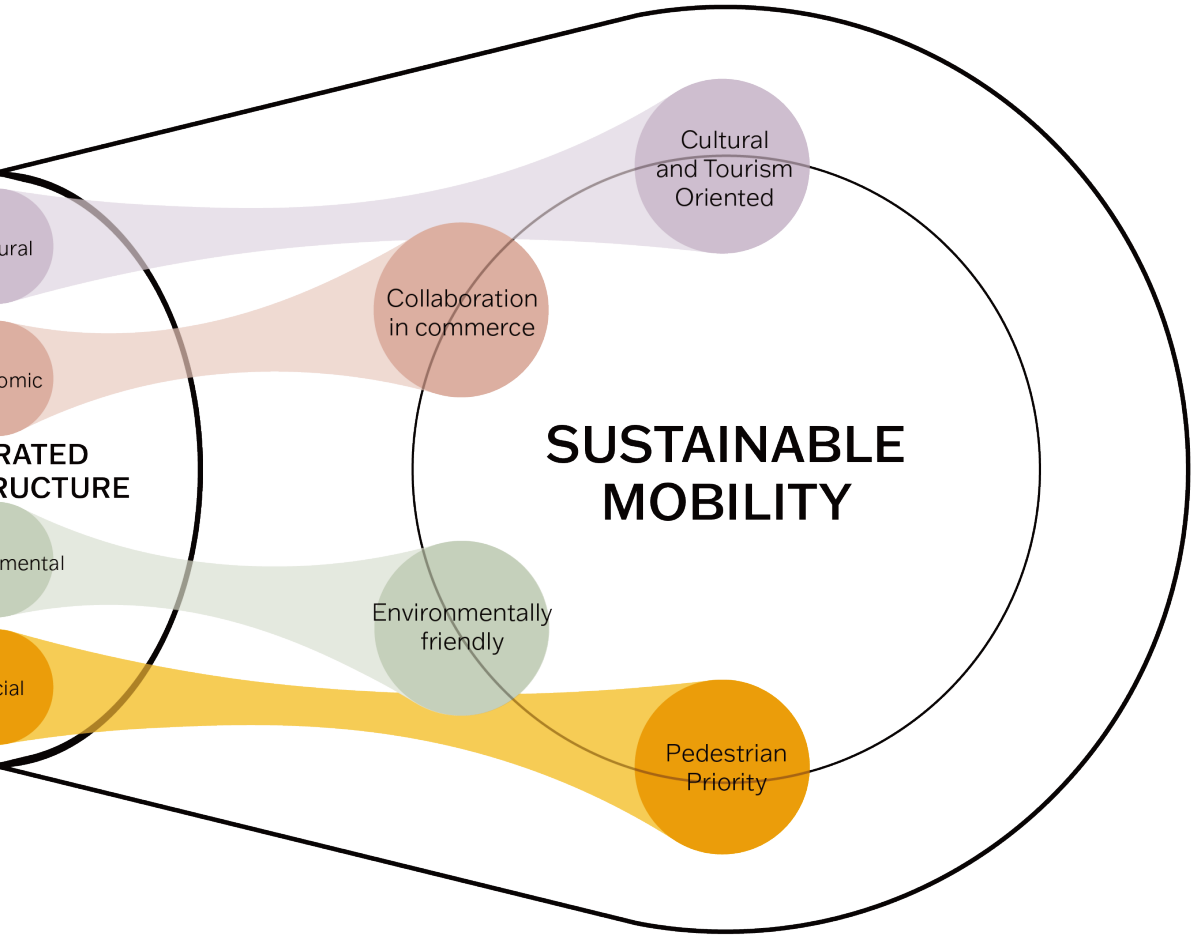


Fig.4.9 conceptual fram

The conceptual framework speaks to how my research que steps in the design. It illustrates the interconnectedness of "Sustainable Mobility" by 4 dimensions where they intersec heritage promotion, retail and commerce activation, eco interaction. Integrated Infrastructure is broken down into cultu a holistic approach to infrastructure that supports various fa and tourism-oriented transportation, environmentally friend under each of the two broad objectives, and this writing is s viaduct redesign needs to satisfy mobility as well as livability. the four goals of mobility. At the same time, the two smaller g



ework, made by author

estion will be addressed and serves as a guide for the next
f "Neighbourhood Livability," "Integrated Infrastructure," and
ct. Neighbourhood Livability includes elements like cultural
logical environment optimization, and enhanced resident
ural, economic, environmental, and social elements, signifying
acets of urban life. Sustainable Mobility emphasizes cultural
ly options, and prioritizing pedestrians. There are four goals
satisfied through the design of integrated infrastructure. The
The viaduct has to follow the four goals of livability as well as
goals of the same dimension are actually mutually reinforcing.

Methodology

RESEARCH METOHODS AND OUTCO

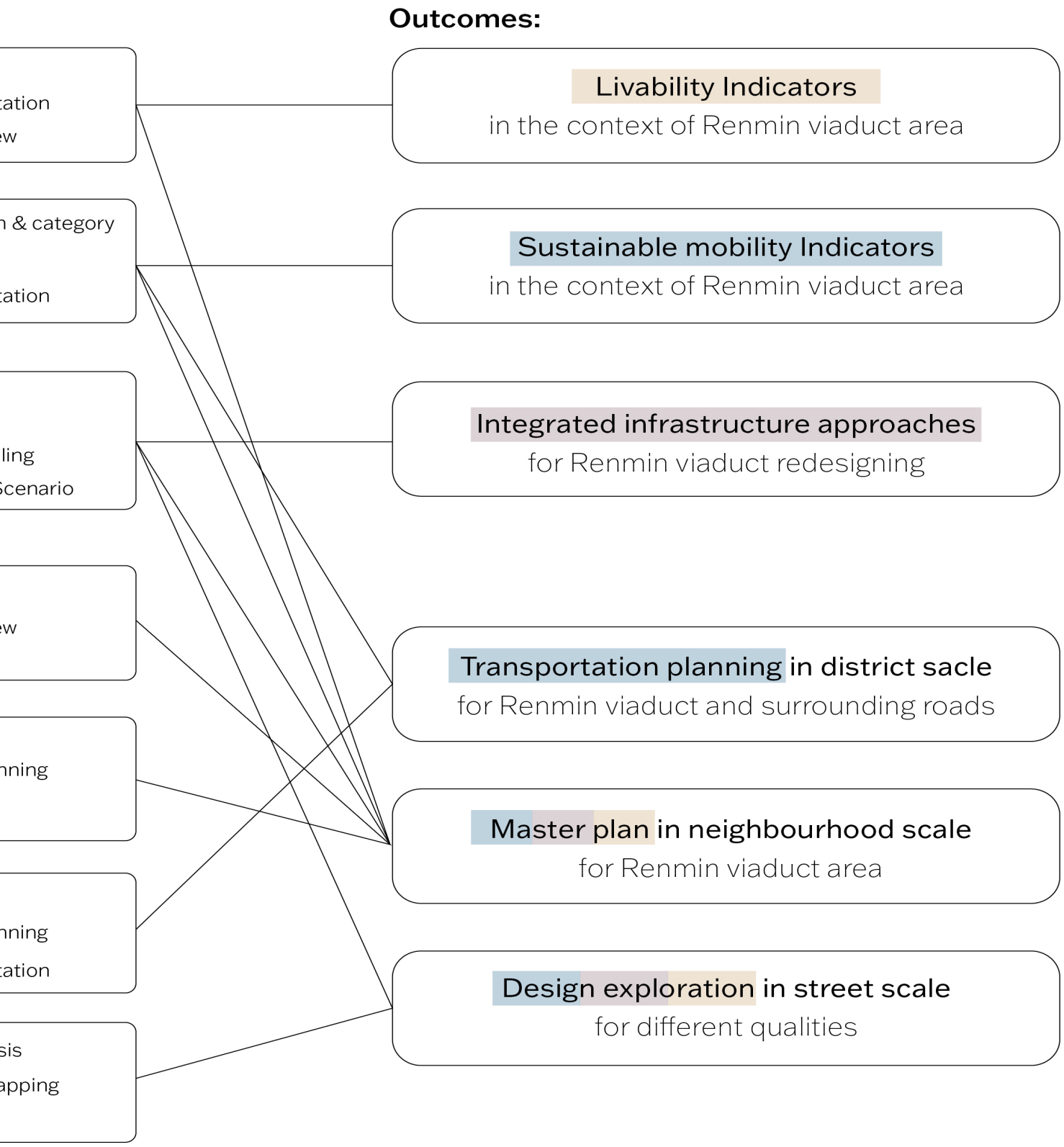
Main Research Question

How can we achieve a sustainable mobility transformation by integrated infrastruc
improve the neighbourhood livability to regenerate the Renmin Viaduct area in Gua

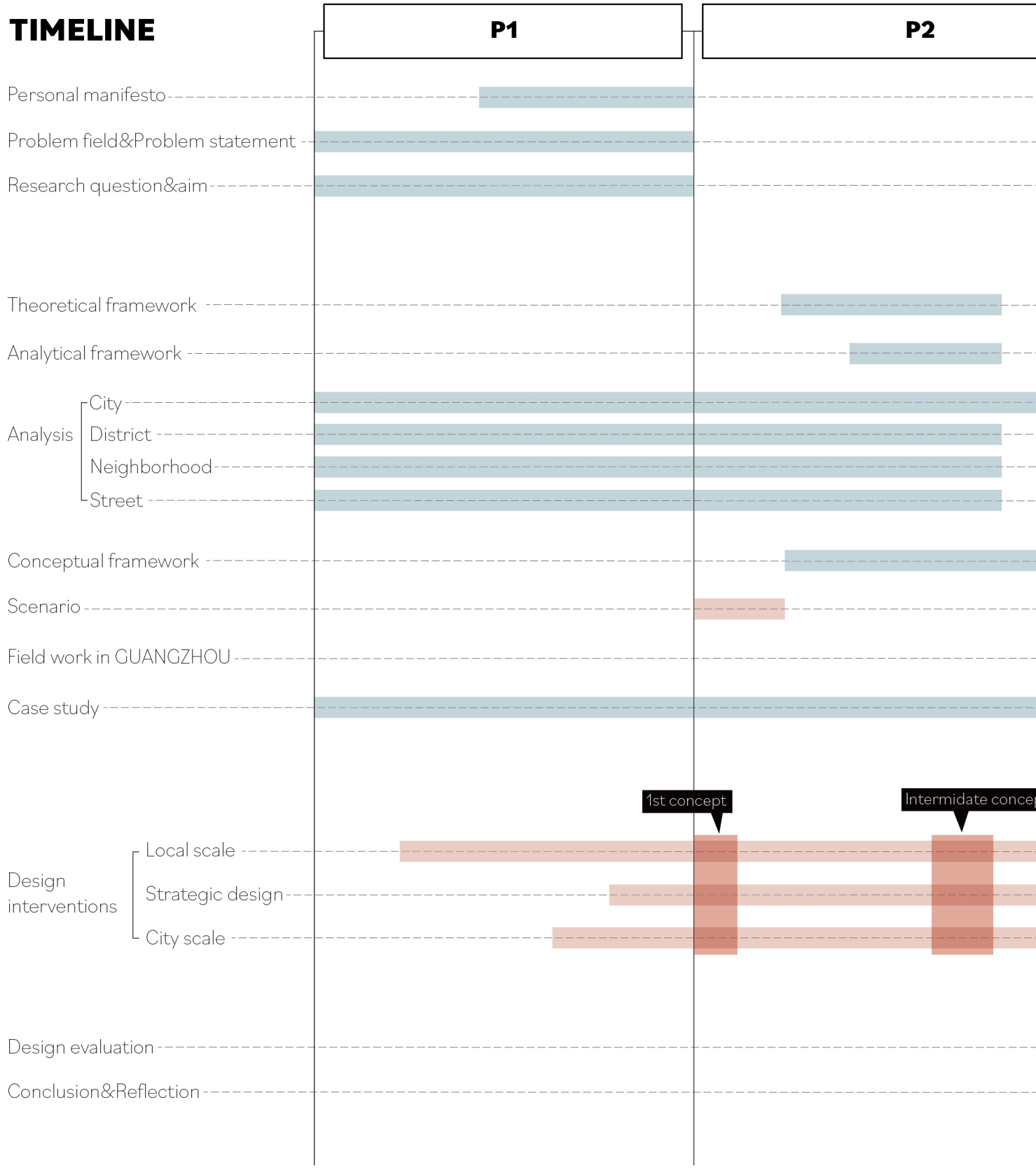
Sub Research Questions:	Methods:
SQ1: What are the **values** of **livability** in the context of Renmin Viaduct area?	Field work Policy Interpret Literature revie
SQ2: What are the **development models** of **sustainable mobility** in the context of Guangzhou?	DATA collectio Case study Policy Interpret
SQ3: What are the **approaches** that enable renmin viaduct to be an **integrated infrastructure**?	Case study 3D modelling Physical model Maximization S
SQ4: What is the relationship between Renmin viaduct itself, mobility and livability?	Case study Literature revie
SQ5: How to achieve **sustainable mobility** and **neighbourhood livability** in the Renmin viaduct area at the same time?	Placemaking Multiscalar pla
SQ6: How to **minimize** the impact on the larger-scale transportation system when redesigning the viaduct?	Space synax Multiscalar pla Policy Interpret
SQ7: How can existing people mobility behavior be leveraged as a favorable basis for mobility redesign?	Typology analy Morphology ma Placemaking

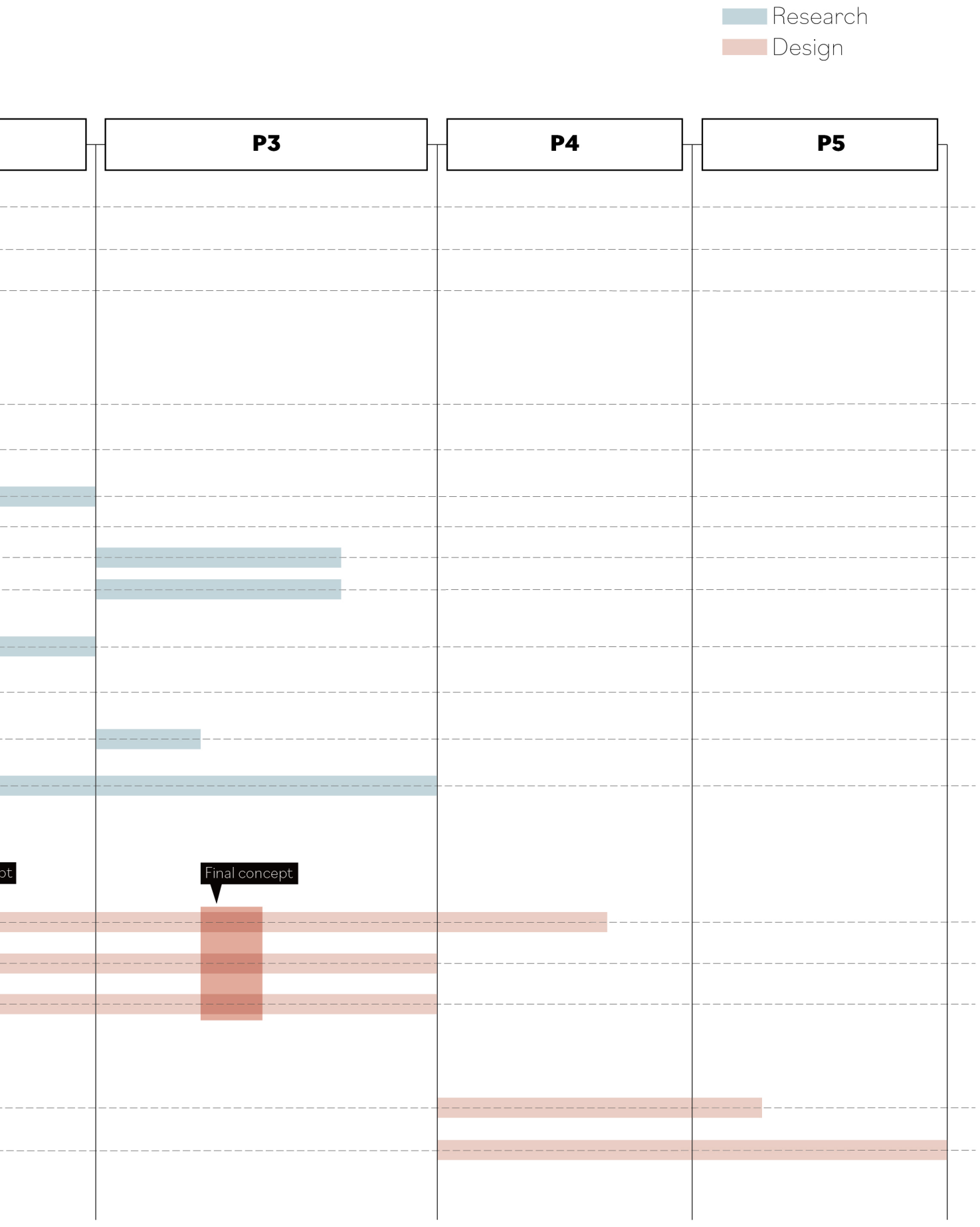
MES

ture, while simultaneously
angzhou?



Methodology
RESEARCH TIMELINE




Research
Design
P3
P4
P5
Final concept

05

ANALYSIS

Analysis

BASIC INFO OF RENMIN VIADUCT NEIGHBOURHOOD

The community has high building densities and diverse land uses, including residential, commercial service, business office, sports and cultural areas, educational and research areas, and administrative offices, demonstrating the mixed-use and comprehensive nature of the area. The high density of buildings in the community indicates that this is a historic and well-developed area that requires special attention to the preservation of historic buildings and rational planning and renovation in order to retain its unique cultural heritage.

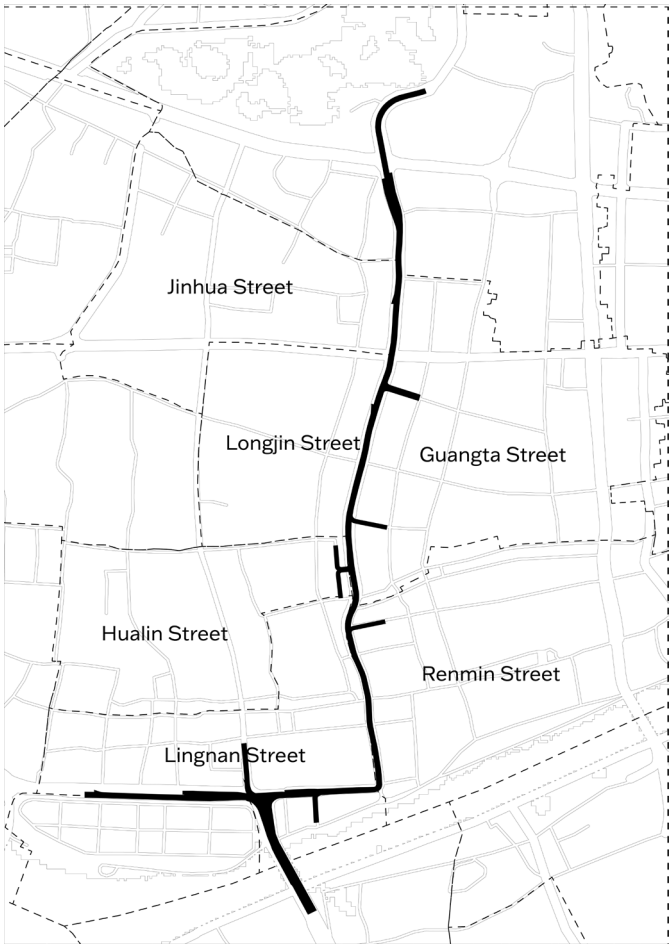
A well-developed transportation network is a key feature of the community. Transportation facilities include viaducts, major arterials and minor arterials that run through the community, forming the main transportation arteries that facilitate residents' daily travel. In addition, the community is dotted with several subway stations and major bus stops, and these public transportation facilities greatly enhance residents' ease of travel and accessibility to the community.

Major streets such as Jinhua Street, Longjin Street, Guangta Street, Hualin Street, Renmin Street and Lingnan Street run through the neighborhood. These streets not only serve as important transportation arteries, but also act as commercial and cultural axes that connect various functional areas within the community. Many historic buildings and cultural attractions may be located along these streets and are priority areas for preservation and development.

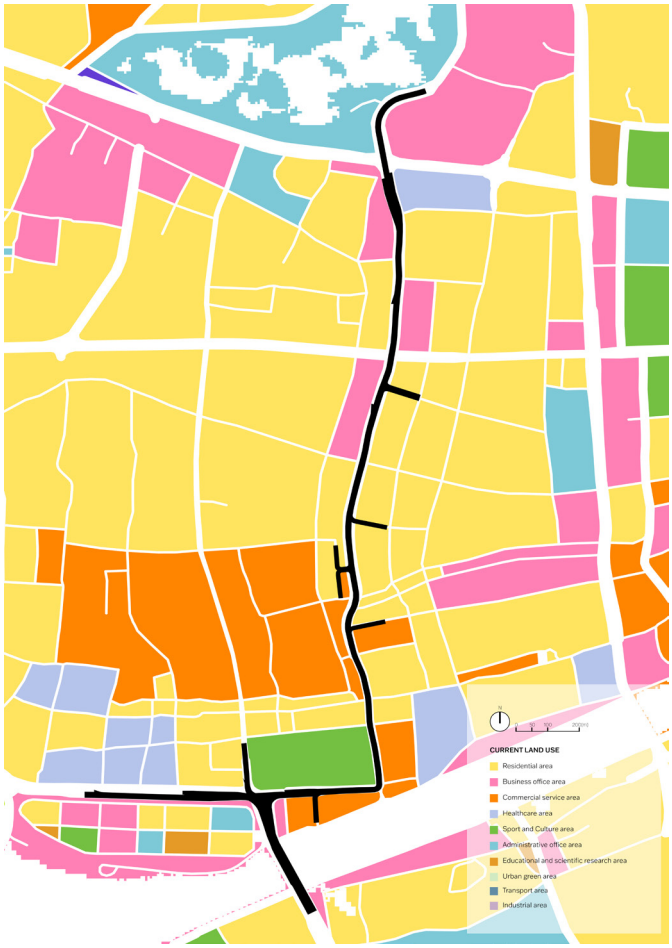
The community's current land use map shows a clear distribution of the various functional areas. Residential areas (yellow zones) provide a large amount of living space for residents; commercial service and business office areas (pink zones) focus on providing commercial activities and office space; sports and cultural areas and urban green spaces (green zones) show the community's emphasis on recreational facilities for residents; educational and research areas (orange zones) demonstrate the community's rich educational resources; and administrative office areas (blue zones) reflects the administrative functions of the community.

Overall, the community has rich historical and cultural connotations and great potential for cultural and tourism development. Through appropriate infrastructure renovation, the cultural and tourism values can be further enhanced while preserving the historical buildings. In particular, the renovation of the viaduct needs to take into account the protection of the historic buildings and the connection of the cultural attractions by reusing the space above and below the bridge to set up cultural exhibitions and retail stores combining history, and by designing the appearance so that the infrastructure itself will become a tourist attraction, thus comprehensively enhancing the community's cultural and tourism attractiveness.

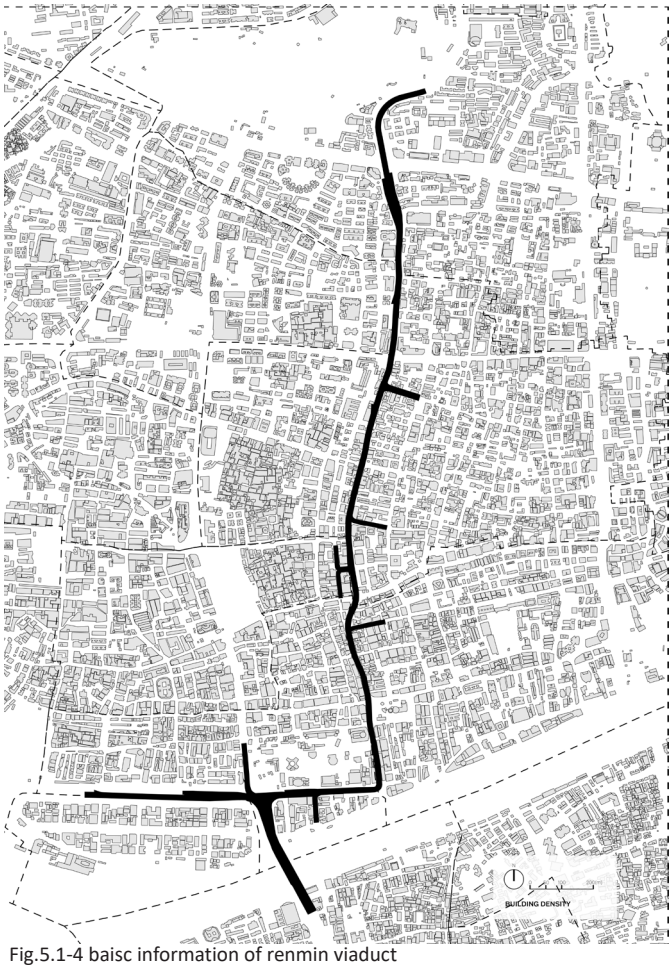
Street administrative boundaries



Current land use



Building density



Current Transportation

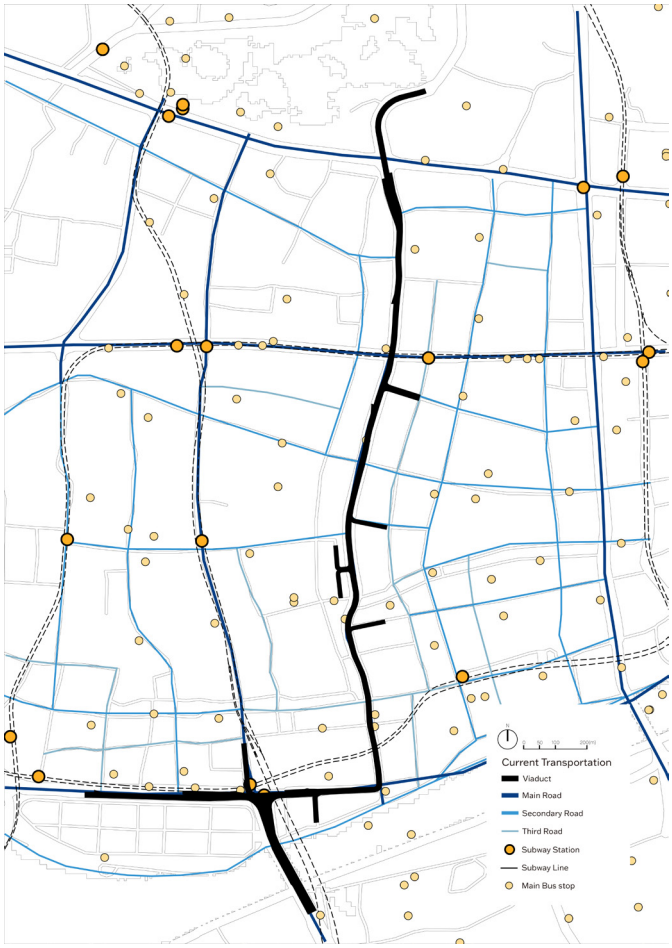
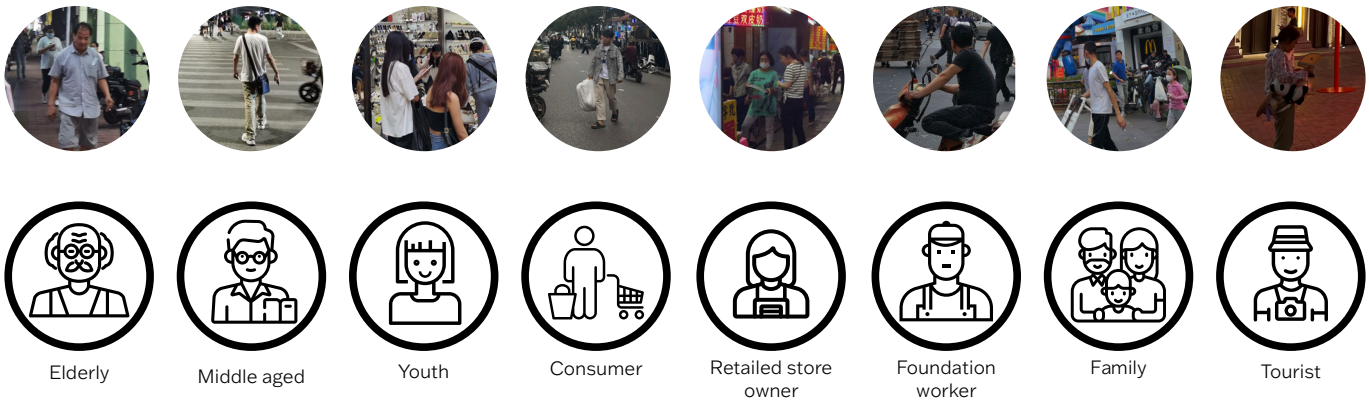


Fig.5.1-4 baisc information of renmin viaduct neighbourhood, made by author

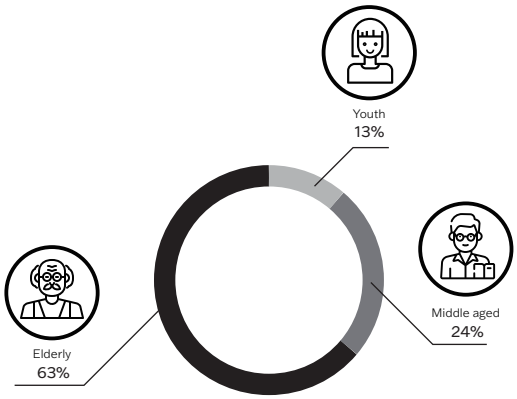
Analysis

BASIC INFO OF RENMIN VIADUCT NE

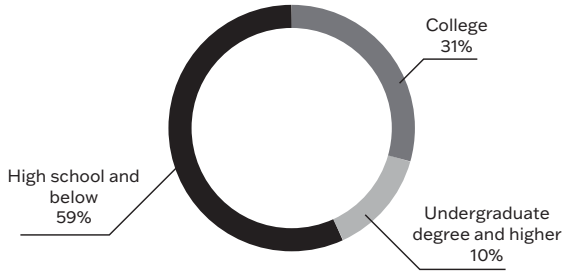
Portraits of people



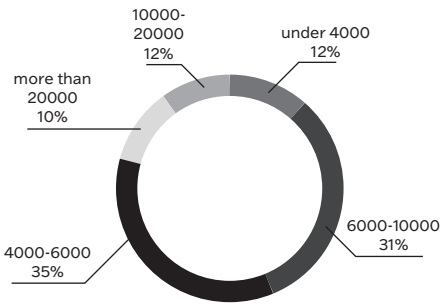
Age composition of the population



Education level of the population



Income level of the population



Occupation of the population

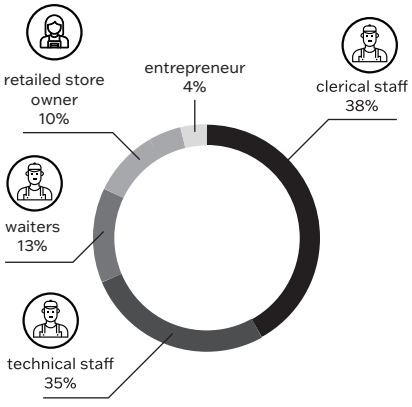


Fig.5.5-8: age,education,income,occupation information of renmin viaduct neighbourhood, made by author,source:www.data-dance.com

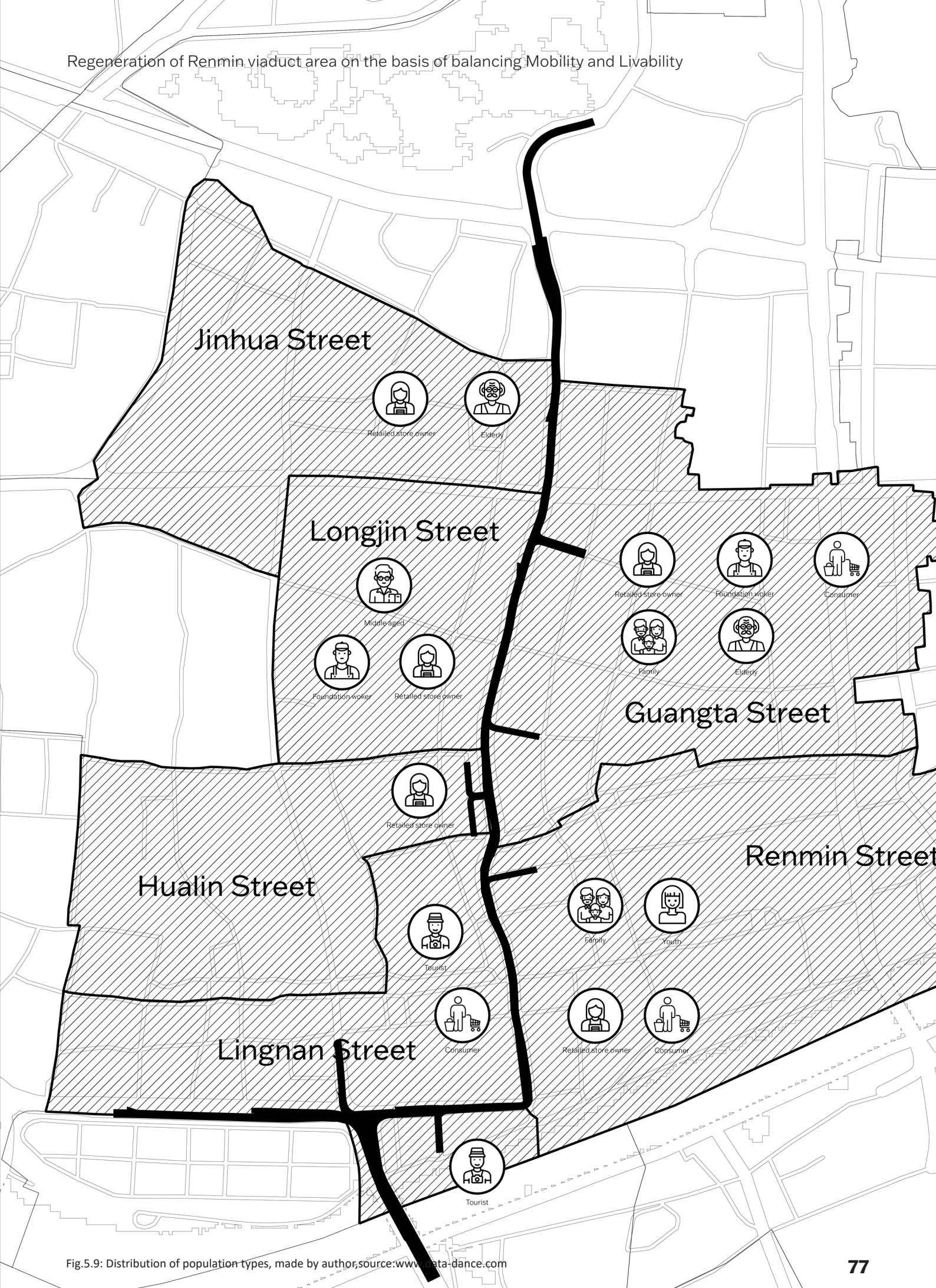


Fig.5.9: Distribution of population types, made by author,source:www.data-dance.com

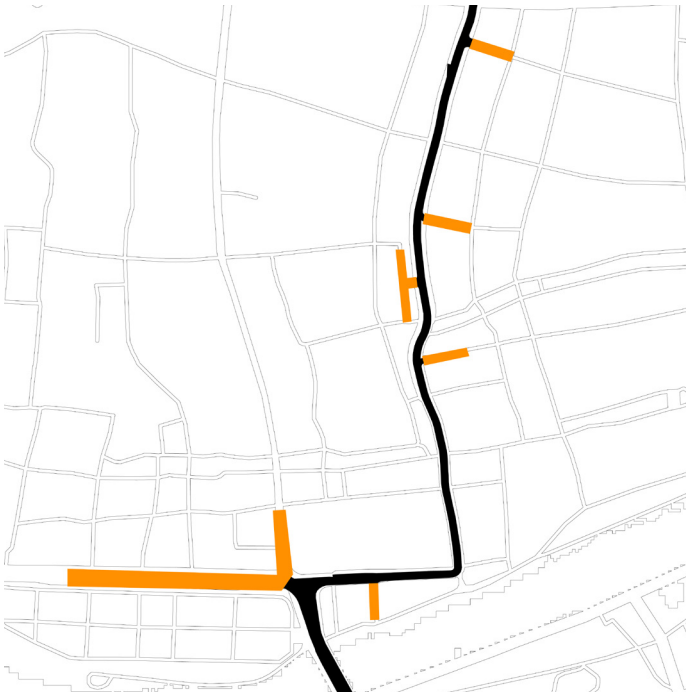
Analysis

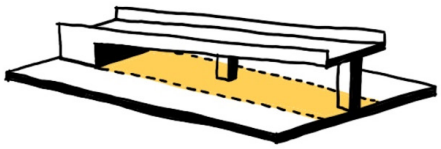
BASIC INFO OF RENMIN VIADUCT NE

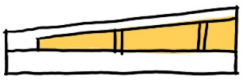
Typology of viaduct construction

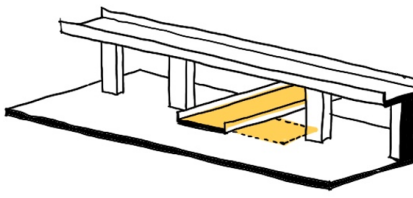
Ramp space

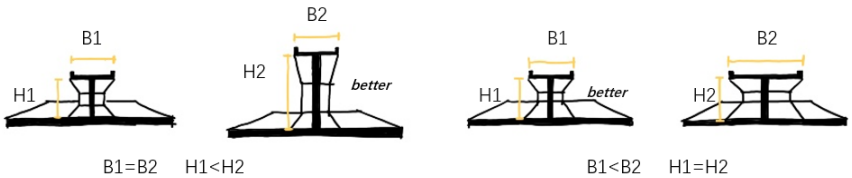
Interlocking space











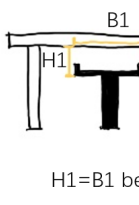
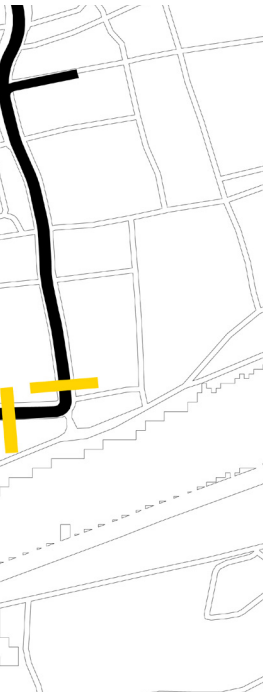
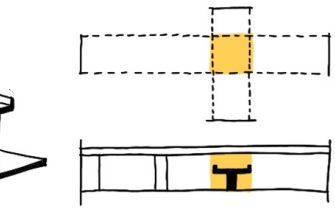


Fig.5.10-12: typology of viaduct construction, made by author

IGHBOURHOOD

Linear space





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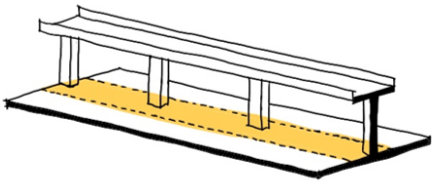
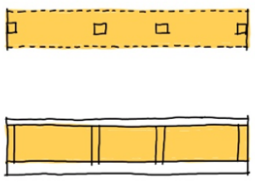
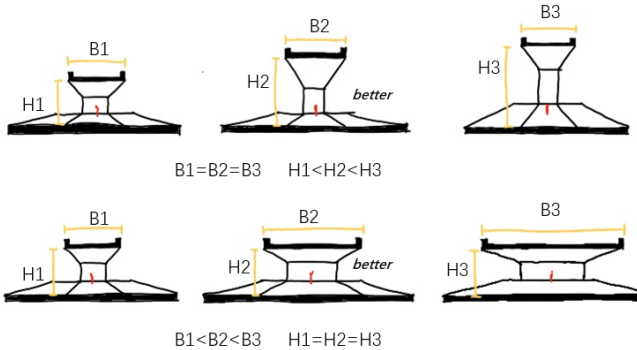


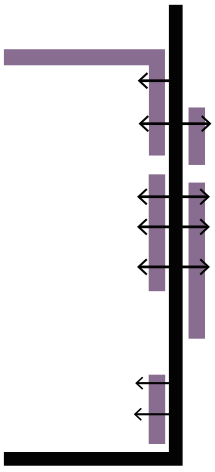




Analysis

SUSTAINABLE MOBILITY ANALYSIS

Cultural and Tourism Oriented analysis



Historical Building

The area with the lowest synergy between transportation and cultural tourism

This map illustrates the distribution of the transportation network and cultural tourism sites along the Renmin Road Viaduct in Guangzhou. The analysis clearly shows a lack of effective integration between vehicular traffic and cultural tourism, resulting in cultural and transportation resources not being fully optimized, with the southern section of the viaduct being the most problematic area.

The southern section of the viaduct is home to numerous historical buildings and cultural sites, such as the Thirteen Factories, Shangxiajiu Pedestrian Street, Hualin Temple, and the Sacred Heart Cathedral. However, the presence of the viaduct has severed these important cultural heritage sites, isolating what could have been a connected cultural tourism corridor.

Additionally, the space beneath the viaduct is dominated by heavy traffic and lacks pedestrian facilities, making it difficult for walkers and cyclists to safely and conveniently travel between these sites. This severely impacts the tourism experience for visitors and the daily lives of local residents. Although public transportation does cover some of these sites, the lack of efficient pedestrian and cycling connections means overall accessibility remains low, and the potential benefits of public transportation are not fully realized.

The problems are most acute in the southern section of the viaduct, where the concentration of historical buildings and cultural heritage is the highest, but so is the severance caused by the viaduct. This makes it impossible for these cultural resources to form a continuous, walkable tourism route, severely restricting the movement of visitors between sites and significantly diminishing the convenience and overall experience of tourism.

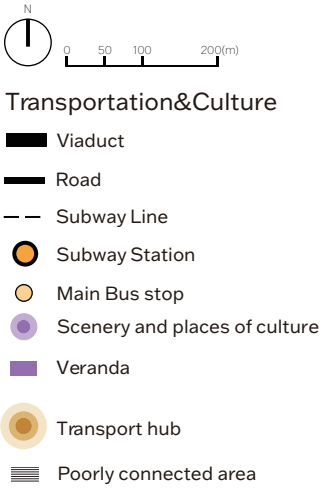
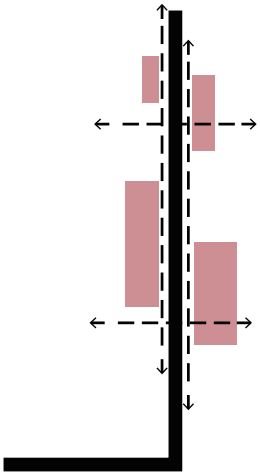


Figure 5.13: cultural history scenery distribution and traffic based on open data from gaodemap

Analysis

SUSTAINABLE MOBILITY ANALYSIS

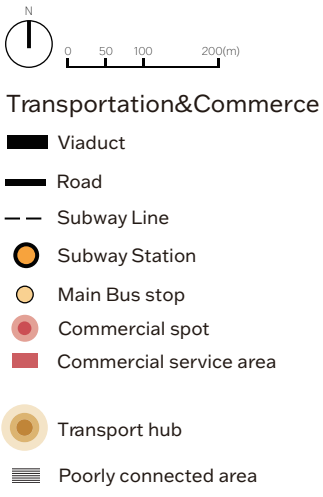
Collaboration in commerce



Commercial Street

The area with the lowest synergy between transportation and retailed commerce

This map illustrates the distribution of the transportation network and commercial activities along the Renmin Road Viaduct in Guangzhou. The analysis clearly shows a low degree of integration between vehicular traffic and commercial activities, with the southern section of the viaduct being the most problematic area. The southern part of the viaduct concentrates a large number of commercial activity points, but the viaduct isolates these points, hindering convenient access for customers. Although some commercial points are within 500 meters of the viaduct, the lack of effective pedestrian and cycling connections makes it difficult for customers to conveniently reach these points, reducing the overall attractiveness of the commercial area. The space under the viaduct, due to heavy traffic flow, lacks pedestrian facilities, making it unsafe and inconvenient for pedestrians and cyclists to move between commercial points, severely affecting the shopping experience for customers and the daily lives of local residents. Although public transportation partially covers these commercial points, the lack of efficient pedestrian and cycling connections means overall accessibility remains low, and the potential benefits of public transportation are not fully realized. The problems are most acute in the southern section of the viaduct, where commercial activities are most concentrated but also most severely cut off by the viaduct. The viaduct prevents these commercial points from forming a coherent, attractive commercial district, severely restricting customer movement between points and significantly diminishing shopping convenience and overall experience. Therefore, from the perspective of integrating transportation and commercial activities, this map reveals significant current issues, especially in the southern section of the viaduct. Solving these issues and connecting transportation and commercial activities is key to enhancing the overall vitality and commercial attractiveness of the area.



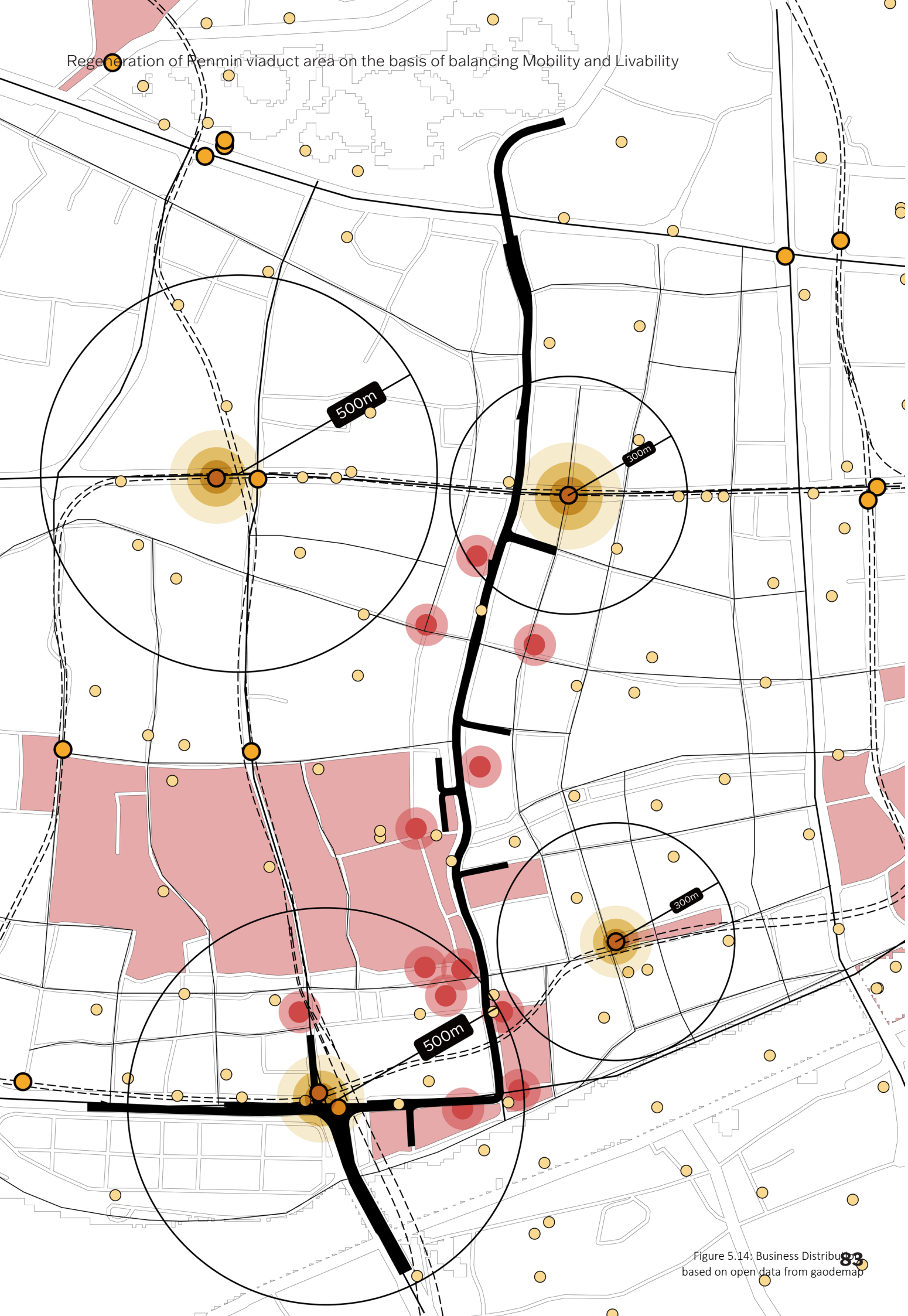
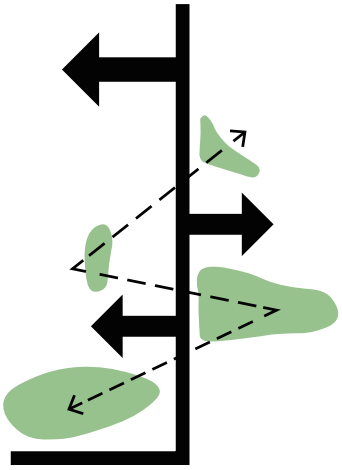


Figure 5.14: Business Distribution
based on open data from gaodemap

Analysis
SUSTAINABLE MOBILITY ANALYSIS

Environmentally friendly



Greenery

The areas with low green coverage and noise pollution

These maps illustrate the transportation network and green space coverage in the Renmin Road Viaduct area in Guangzhou. The analysis clearly shows that the traffic conditions around the viaduct have negatively impacted the green spaces in the area, primarily in terms of pollution and the obstruction of green space accessibility.

Firstly, the viaduct and its traffic flow have caused significant noise and air pollution. From the first map, it is evident that noise pollution levels are high along the viaduct, especially in the areas on both sides of the viaduct. This not only negatively affects the quality of life for nearby residents but also harms the surrounding green environment. Noise and air pollution can impact the growth conditions for plants, reducing the ecological value and aesthetic appeal of green spaces, while also decreasing residents' willingness and frequency to use these green areas.

Secondly, the presence of the viaduct has created a significant barrier to the accessibility of green spaces. Although there are some green spaces in the area, the viaduct disrupts their connectivity, creating many isolated fragments of green space. The viaduct separates these green areas, making it difficult for pedestrians and cyclists to move safely and conveniently between them, severely affecting the efficiency of green space use and the recreational experience of residents.

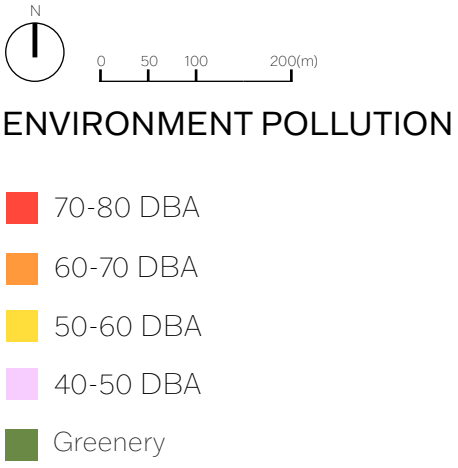
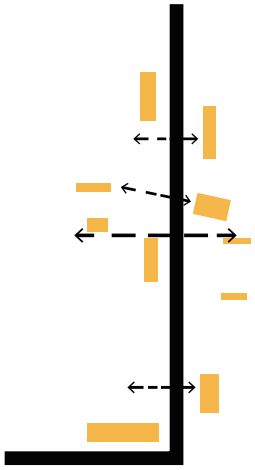


Figure 5.15: environment pollution,
SOURCE:Traffic Noise Research Team, Intelligent Transportation Center, College of Engineering, Sun Yat-sen University, China)

Analysis

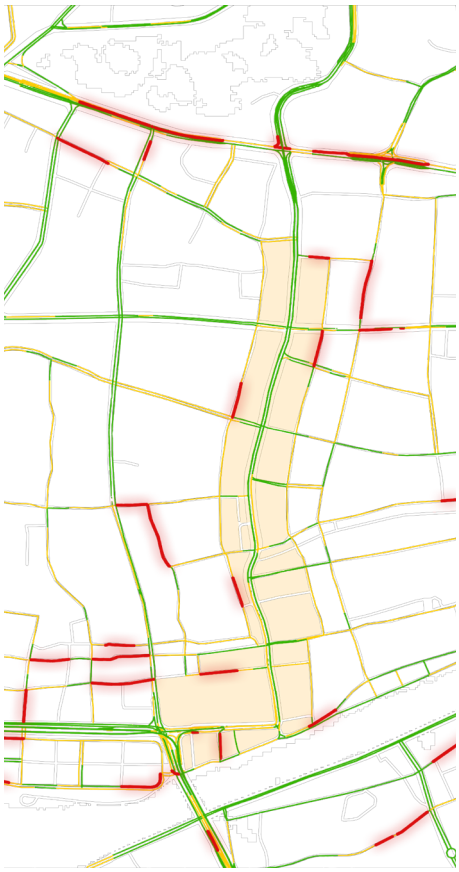
SUSTAINABLE MOBILITY ANALYSIS

Pedestrian Priority



Public space

Lowest Pedestrian Convenience Areas



The distribution of traffic network and non-motorized vehicle lanes in the Renmin Road viaduct area in Guangzhou: Although the density of the lanes is high, the speed here is actually very slow and the lane load is small, which means that the traffic volume is not large and so many lanes are not needed. The yellow lines in the pedestrian priority map represent non-motorized vehicle lanes. It can be clearly seen that the non-motorized vehicle lanes in the south of the viaduct are the least complete. The areas painted yellow in the map represent public spaces where people gather. As can be seen from the map, due to the incompleteness of the sidewalks and the low accessibility of public spaces, the convenience of residents and tourists to move around in these areas is greatly limited.

The incompleteness of non-motorized vehicle lanes has led to traffic chaos and increased safety risks for pedestrians and cyclists. In order to improve traffic efficiency and the quality of life of residents, it is necessary to improve the non-motorized vehicle lane network to ensure that non-motorized vehicles and pedestrians can pass safely and conveniently. In addition, by improving the accessibility of public spaces, the utilization rate of these spaces can be increased, so that they can better serve surrounding residents and tourists.

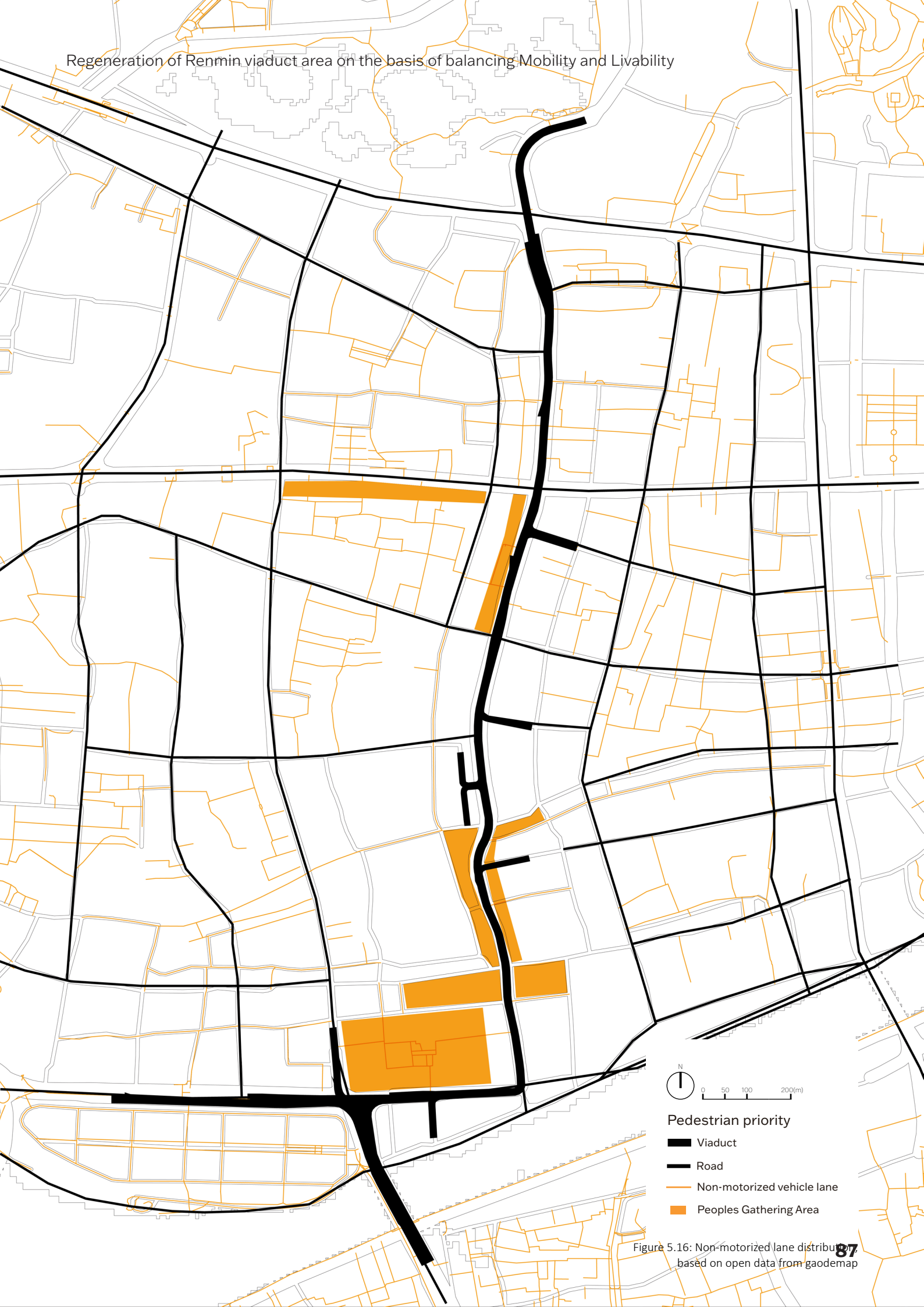


Figure 5.16: Non-motorized lane distribution, based on open data from gaodemap

Analysis

SUSTAINABLE MOBILITY ANALYSIS

Pedestrian Priority

The table on the right illustrates the travel modes of residents in the Renmin Road Viaduct area and predicts the travel modes for the next five years. From the chart, it is evident that non-motorized vehicles constitute a significant portion of residents' daily travel, with bicycles and shared bikes being particularly common. Walking and electric bicycles are also important modes of transportation, indicating that the area's transportation needs are primarily focused on short-distance and low-speed travel modes.

The travel mode predictions for the next five years show that the proportion of non-motorized vehicles and walking will continue to increase. This implies that the area's transportation infrastructure needs to be adjusted and optimized accordingly to accommodate this changing trend. By increasing and improving non-motorized vehicle lanes and pedestrian pathways, the travel needs of residents can be better met, enhancing the area's transportation fluidity and quality of life.

The chart also displays the purposes of residents' travel, including commuting, leisure, and exercise. Overall, residents rely more on non-motorized vehicles and walking to meet their daily travel needs, which contrasts sharply with the current state of the area's transportation infrastructure and pedestrian pathways. The existence of the viaduct and the inadequacies in transportation infrastructure, particularly the incomplete pedestrian and non-motorized vehicle pathways in the southern region, restrict residents' travel convenience and the accessibility of public spaces.

In summary, the areas on both sides of the Renmin Road Viaduct, especially the southern region, are more suitable for planning additional car-free streets. Considering the high population density and the significant usage of non-motorized vehicles in this area, improving and expanding non-motorized vehicle lanes and pedestrian pathways can not only enhance residents' travel convenience but also improve the accessibility and efficiency of public spaces.

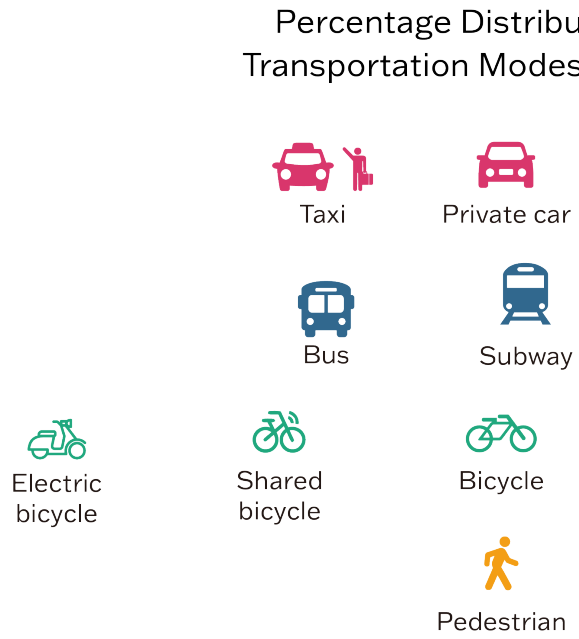


Figure 24: Renmin viaduct neighbourhood travel model, made by a
bsed on guangzhou transport development annual report 2022,Gu
Guangzhou Institute of Transportation Planning

Figure 5.17: Renmin viaduct neighbourhood travel model, made by
bsed on guangzhou transport development annual report 2022,Gu
Guangzhou Institute of Transportation Planning

tion of Current Daily
and Future Prediction

current
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authour
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different activities

Commuting

Leisure

Sport

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uangzhou Municipal Bureau of Planning and Natural Resources,

Figure 5.18: didi taxi
SOURCE:©Financial Associated Press (FAAP)

Figure 5.19: sharing bike
SOURCE:©nansha.xxsb.com

Figure 5.20: electric bicycles on the road
SOURCE:©nansha.xxsb.com

Figure 5.21: guangzhou subway line2
SOURCE:©huanmankanshijie

Analysis

NEIGHBOURHOOD LIVABILITY ANALY

Cultural heritage promotion

Tourism scenery

永庆坊
Yongqingfang

沙面
Shamian

圣心大教堂
Sacred Heart Cathedral

华林寺
Hualin Temple

上下九步行街
Shangxiajiu Pedestrian Street

十三行
Thirteen Hongs

粤海关
Yuehaiguan Mesuem

珠江夜游
Pearl River Night Cruise

Core portection area

Oldest cultural street

Low construction quality

This map shows the distribution of cultural heritage in the Renmin Road Viaduct area in Guangzhou. The area includes many important cultural and historical neighborhoods, such as the Thirteen Factories, Shangxiajiu Pedestrian Street, Hualin Temple, and the Sacred Heart Cathedral. From the perspective of livability, this area has a rich cultural heritage and great potential, but the current quality of space is poor. In particular, the historical buildings on both sides of the viaduct have not been maintained and are in very old and dilapidated condition.

It is especially noteworthy that the southern area of the viaduct has the highest density of cultural heritage and historical buildings but is also the most severely affected by the viaduct.

Highest cultural richness but Lowest space quality Areas

Figure 5.22: cultural history scenery distribution based on Guangzhou Riding Building Conservation Plan 2021

Analysis
NEIGHBOURHOOD LIVABILITY ANALY

Retailed commerce activation

Percentage of business types

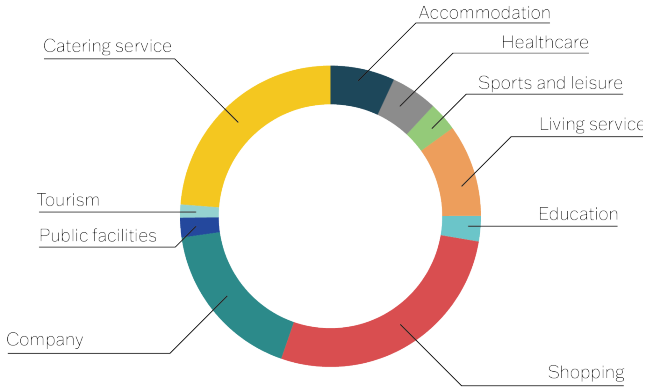


Figure 5.24: Percentage of business types, made by authour
bsed on guangzhou transport development annual report 2022,Guangzhou Municipal Bureau of Planning and Natural Resources, Guangzhou Institute of Transportation Planning

Main business models

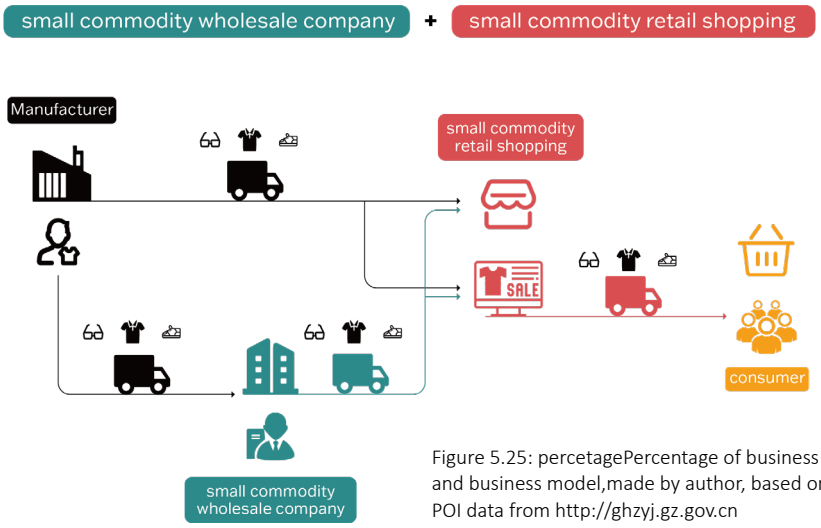


Figure 5.25: percetagePercentage of business types and business model,made by author, based on open POI data from http://ghzyj.gz.gov.cn

This map shows the distribution of businesses in the Renmin Road Viaduct area of Guangzhou. The logistics and hardware industries are mainly concentrated in specific areas along the viaduct, indicating that these areas are likely to be logistics distribution points and major locations for hardware sales. The eyeglasses and clothing industries are concentrated in the southern part of the Viaduct. The tourism industry, on the other hand, is concentrated in the vicinity of specific cultural and historical attractions, such as the Thirteen Houses and the Shangxiajiu Pedestrian Street, which attract a large number of tourists. Electronics are more sporadically distributed but are also found on both sides of the viaduct. Restaurants, retail and wholesale businesses are also widely distributed in the area, with restaurants mainly concentrated around the Viaduct, providing food and beverage services to residents and tourists.
Commercial activities along the viaduct are diverse and intense, contributing to the quality of life and vibrancy of the area.

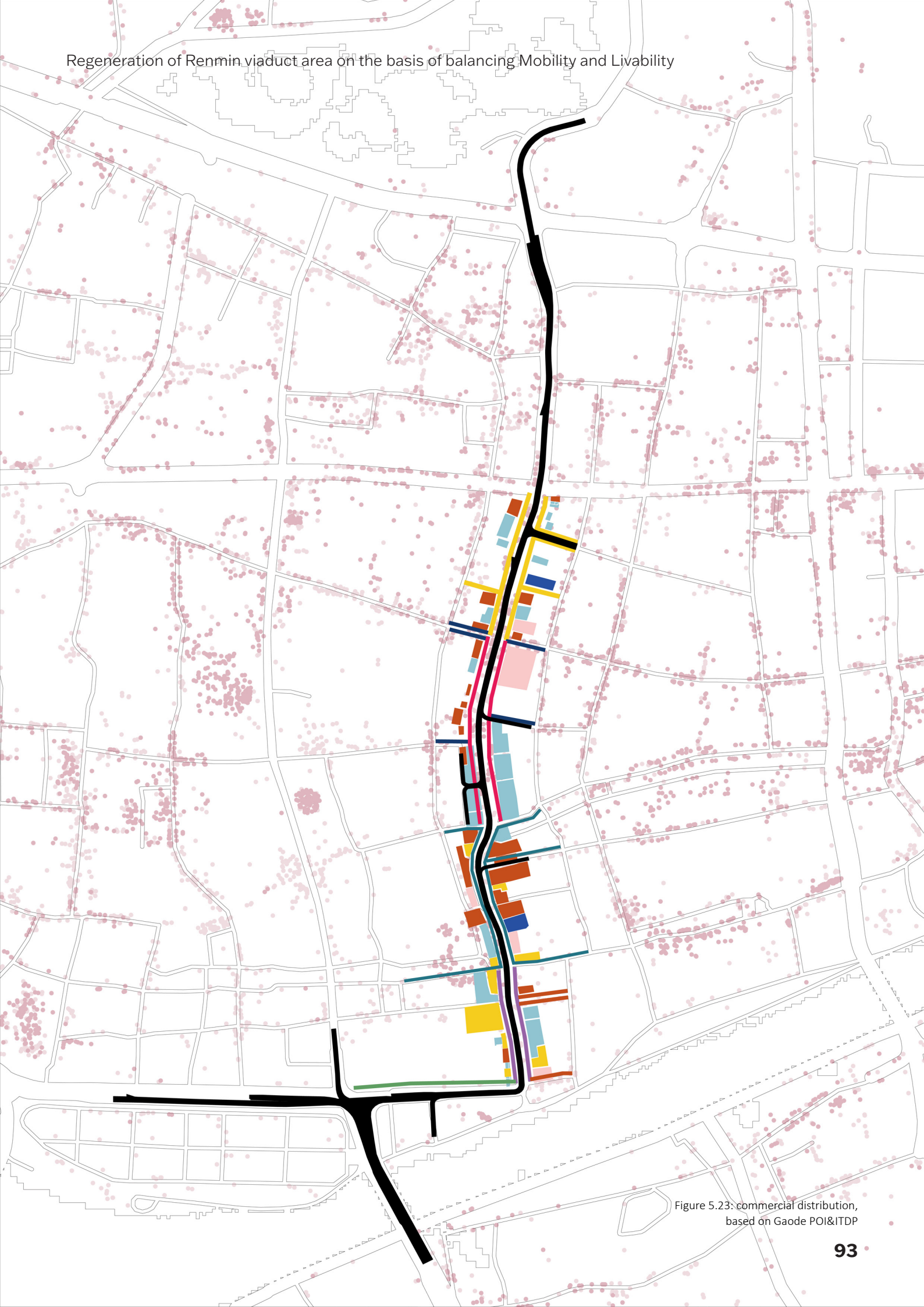


Figure 5.23: commercial distribution, based on Gaode POI&ITDP

Analysis

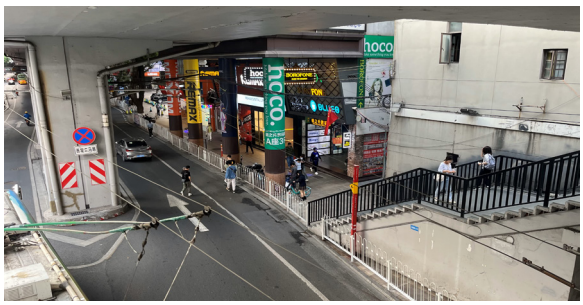
NEIGHBOURHOOD LIVABILITY ANALY

Retailed commerce activation

Lowest quality





Areas with the worst quality commercial streets

General quality


As can be seen from the figure, the quality of streets in the area south of the viaduct is particularly poor, with most of these streets being of minimum or average quality, indicating a poorer business environment in this area. The existence of the viaduct has a negative impact on the connectivity and overall quality of commercial streets.

The quality of commercial streets has a significant impact on business activity and the quality of life for residents. Low-quality commercial streets may lack good infrastructure and environment, which can affect how well stores operate and the shopping experience of residents. By improving the quality and connectivity of streets, the commercial vitality and livability of the area can be significantly enhanced.

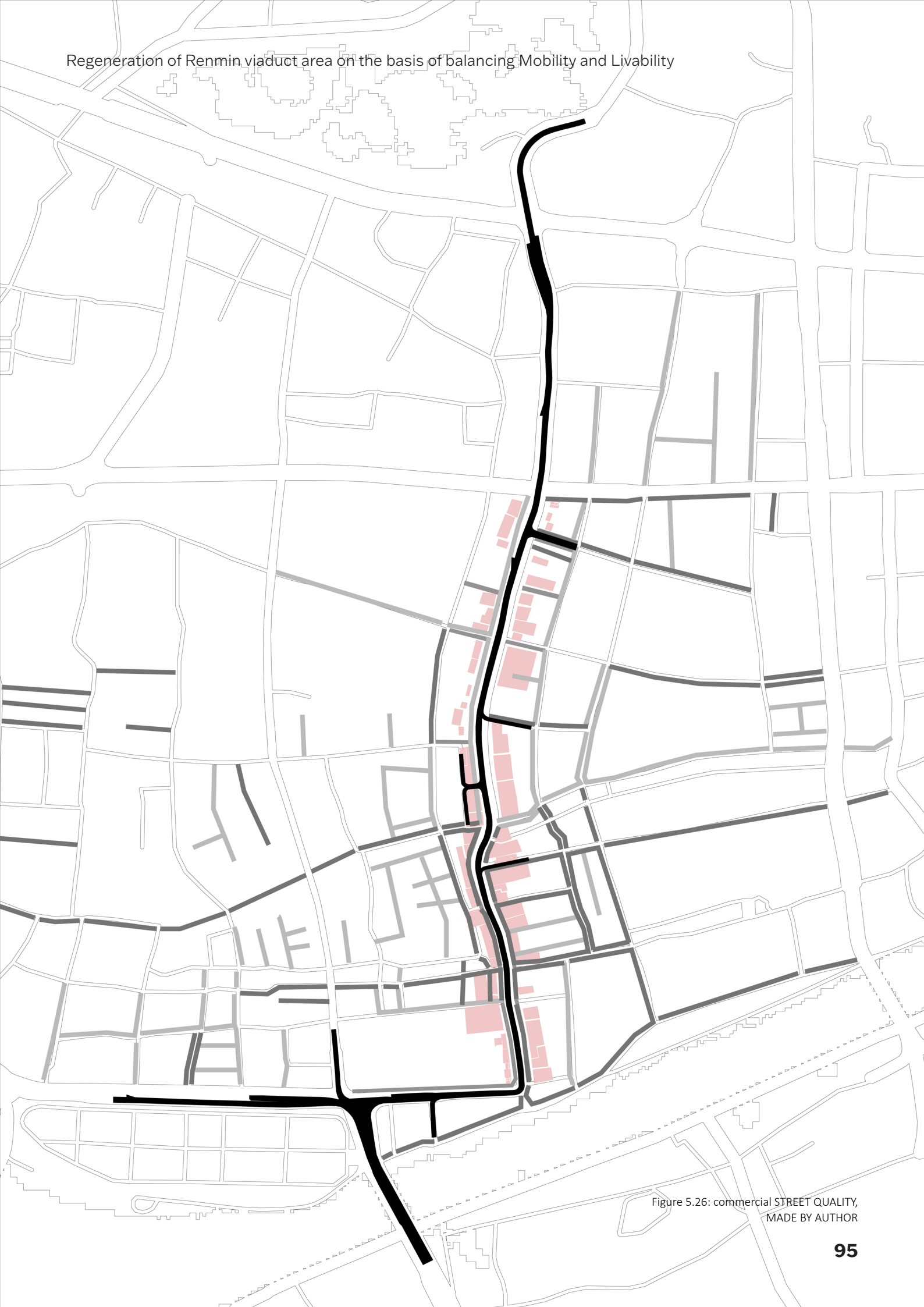


Figure 5.26: commercial STREET QUALITY, MADE BY AUTHOR

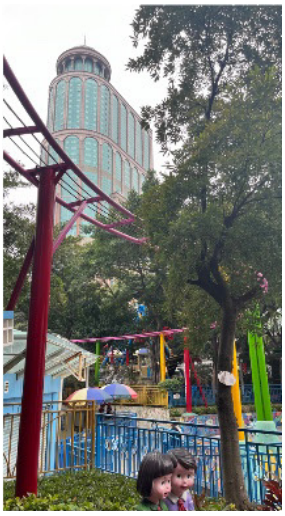
Analysis

NEIGHBOURHOOD LIVABILITY ANALY

Ecological environment optimization

Good greenery

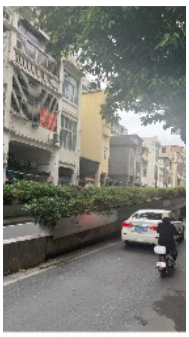




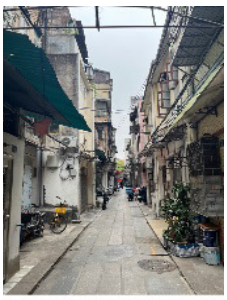
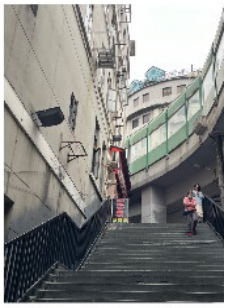
Average greenery



Poor greenery



No greenery


There is a complete lack of greenery on both sides of the viaduct, especially in the southern area. In addition, many of the orange areas show areas of poor greening quality with a single plant species or poorly maintained areas that do not provide good ecological services and recreational space. These areas are mainly located in the southern and central parts of the viaduct. The yellow areas indicate areas with average greening quality, which have some greening coverage but are still insufficient to meet residents' demand for high quality greening, and are mainly distributed in the northern and partially central areas of the viaduct. There are fewer green areas of high quality greenery, concentrated in the northern part of the viaduct and some of the peripheral areas. There are obvious deficiencies in the quality of greenery in the People's Road Viaduct area, particularly in the southern and central areas of the viaduct, where the poor quality of greenery and lack of greenery is particularly problematic.

Areas with the lowest quality greenery

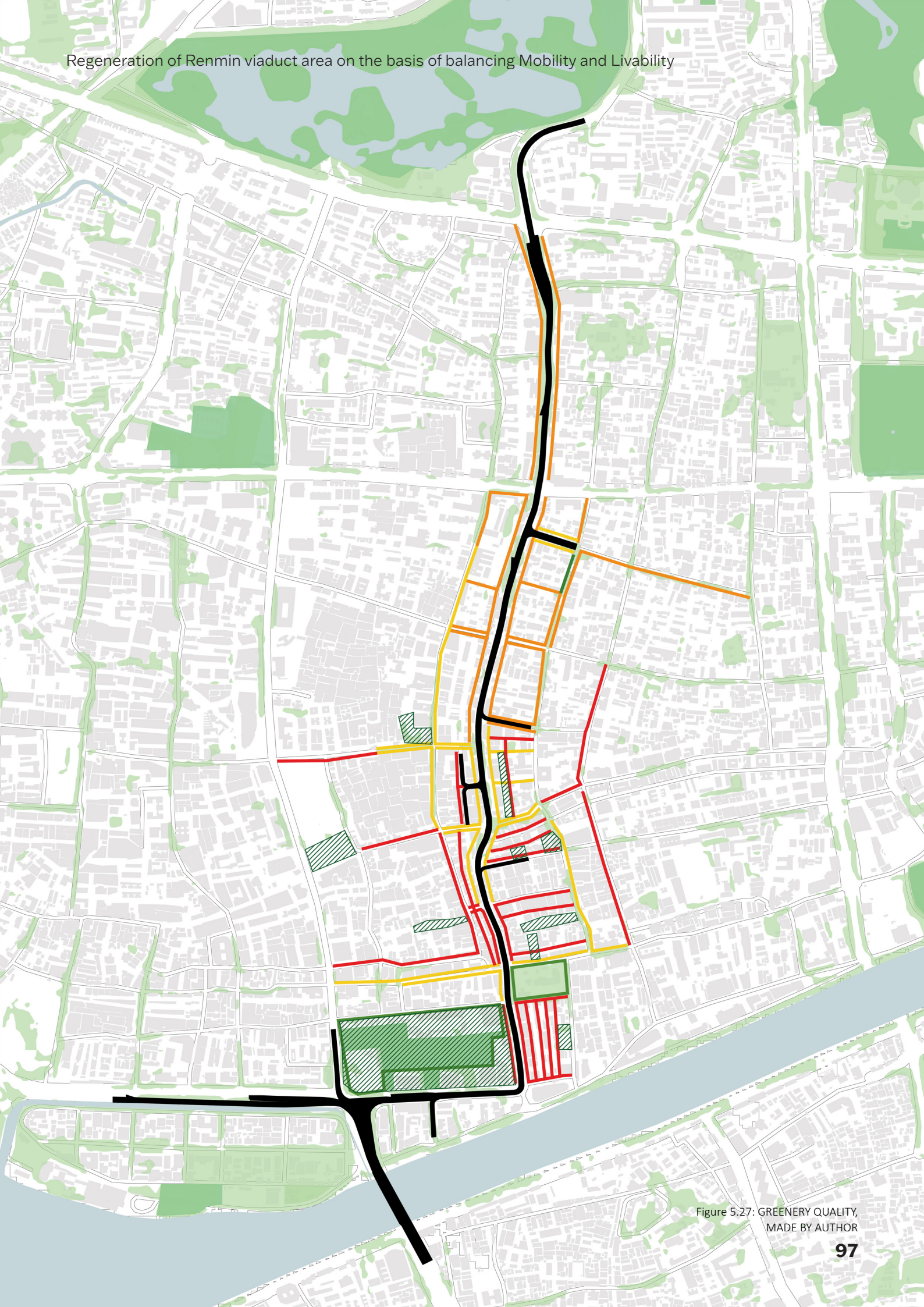


Figure 5.27: GREENERY QUALITY, MADE BY AUTHOR

Analysis

NEIGHBOURHOOD LIVABILITY ANALY

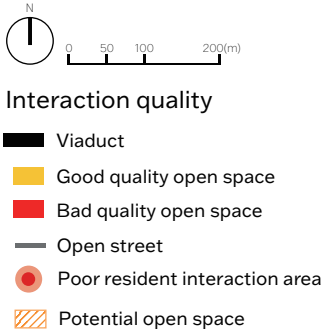
Enhanced resident interaction

Good quality

Bad quality

There is a complete lack of greenery on both sides of the viaduct, especially in the southern area. In addition, many of the orange areas show areas of poor greening quality with a single plant species or poorly maintained areas that do not provide good ecological services and recreational space. These areas are mainly located in the southern and central parts of the viaduct. The yellow areas indicate areas with average greening quality, which have some greening coverage but are still insufficient to meet residents' demand for high quality greening, and are mainly distributed in the northern and partially central areas of the viaduct. There are fewer green areas of high quality greenery, concentrated in the northern part of the viaduct and some of the peripheral areas. There are obvious deficiencies in the quality of greenery in the People's Road Viaduct area, particularly in the southern and central areas of the viaduct, where the poor quality of greenery and lack of greenery is particularly problematic.

Areas with the lowest quality open space



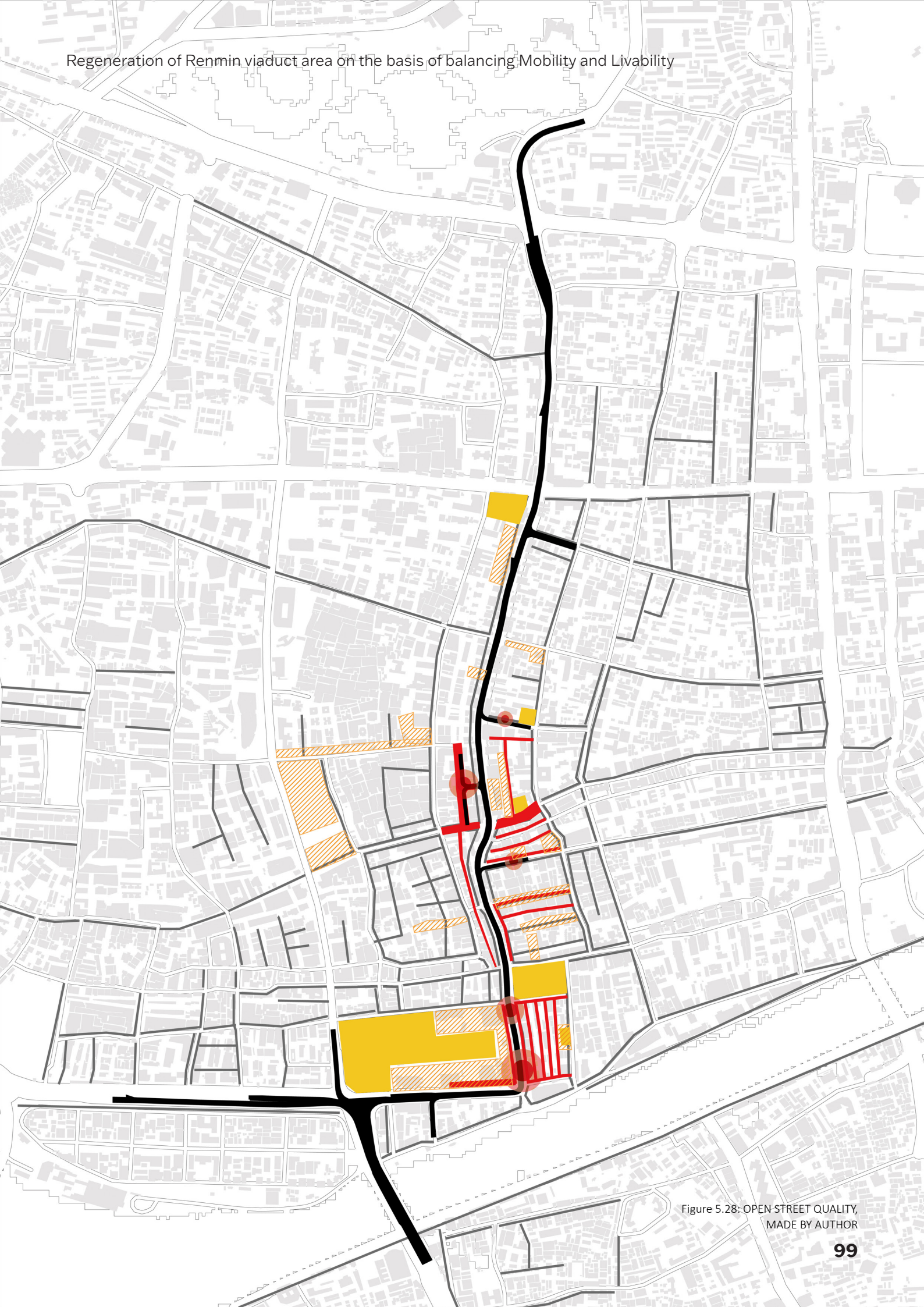


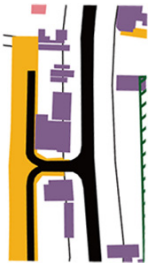
Figure 5.28: OPEN STREET QUALITY,
MADE BY AUTHOR

Analysis
INTEGRATED INFRASTRUCTURE ANA

2

The existing viaduct does not interfere with commercial operations on either side, does not damage historic buildings, and does not affect daily life. Traffic flow is normal and there is little need to remove or change to comprehensive infrastructure.

3



The viaduct has severely damaged the public spaces and historical buildings of the residents here. There is a need to transform it into an integrated infrastructure with a focus on social and cultural transformation. It is proposed to demolish part of the viaduct directly in order to gain open street space and to eliminate the threat of the viaduct to the historic buildings, and to provide more public space above and below the bridge.

Cultural Social

4

The viaduct currently destroys mainly historic buildings and retail businesses on both sides. However, there is significant potential for historic development here. There is therefore a need to transform this section into an integrated infrastructure with a cultural and economic focus, mainly through structural setbacks from the viaduct to protect the historic buildings, as well as extending parts of the bridge to connect different historic sites and stores, and through the reuse of the space above and below the bridge for cultural exhibitions or historically-integrated retail outlets.

Cultural Economic

5

The viaduct currently destroys mainly retail businesses on both sides. However, there is significant commercial potential here. There is therefore a need to transform this section of the viaduct into an economically focused, integrated infrastructure, which will mainly require structural setbacks from the viaduct to provide more sunlight, open space for stores on both sides and extension of part of the bridge to allow people to walk to the different stores, as well as reuse of the space above and below the bridge to accommodate a number of retail stores.

Economic

6

The viaduct currently undermines the accessibility and quality of the green spaces in the park. It is therefore necessary to transform this section into a comprehensive ecologically oriented infrastructure, mainly through the renovation of the blue-green infrastructure of the viaducts, as well as the extension of some of the bridges to make it easier for people to reach the green parks and to enhance the ecological aspect of the landscape.

Environmental

7

As traditional infrastructure, currently disrupt the historical buildings on both sides and reduce the ease of access to cultural heritage sites. However, this area possesses rich historical and cultural value, offering significant potential for cultural and tourism development. Therefore, it is necessary to transform this section into a comprehensive infrastructure that emphasizes cultural aspects. This involves modifying the elevated highway structure to preserve historical buildings, extending certain sections of the bridge to connect different historical sites, and repurposing the space above and below the bridge for cultural exhibitions or retail shops that incorporate historical elements. Additionally, the exterior should be designed to make the infrastructure itself a tourist attraction.

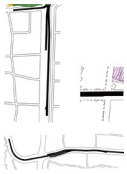
Cultural

8

The viaduct currently disrupt the historical buildings on both sides and reduce the ease of access to cultural heritage sites. However, this area possesses rich historical and cultural value, offering significant potential for cultural and tourism development. Therefore, it is necessary to transform this section into a comprehensive infrastructure that emphasizes cultural aspects. This involves modifying the elevated highway structure to preserve historical buildings, extending certain sections of the bridge to connect different historical sites, and repurposing the space above and below the bridge for cultural exhibitions or retail shops that incorporate historical elements. Additionally, the exterior should be designed to make the infrastructure itself a tourist attraction.

Cultural Environmental

1\9\10



There are no rich cultural, commercial and other businesses on either side of the existing viaduct, and the viaduct itself does not cause negative impacts, so it is recommended to keep it as part of the transportation infrastructure and continue to carry out the transportation function, and there is no need to rebuild it.

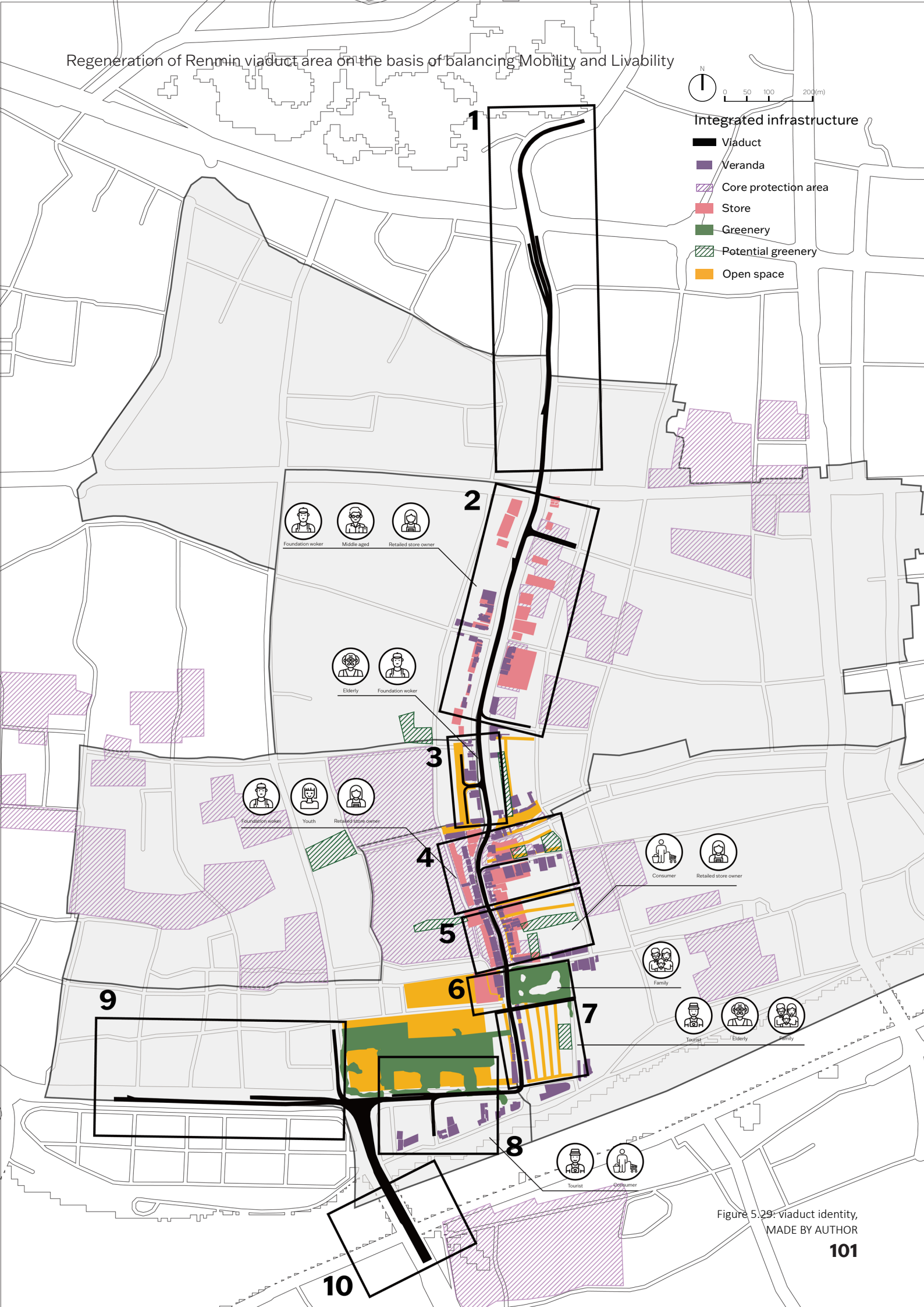


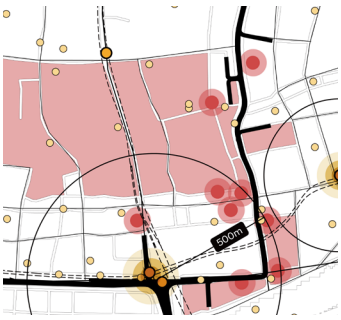
Figure 5.29: viaduct identity,
MADE BY AUTHOR

Analysis
CONCLUSION

SUSTAINABLE MOBILITY ANALYSIS

The area with the lowest synergy between transportation and cultural tourism

Cultural and Tourism Oriented



The area with the lowest synergy between transportation and retailed commerce

Collaboration in commerce

The areas with low green coverage and noise pollution

Environmentally friendly

Lowest Pedestrian Convenience Areas

Pedestrian Priority

NEIGHBOURHOOD LIVABILITY ANALYSIS

Highest cultural richness but Lowest space quality Areas

Cultural heritage promotion

Areas with the worst quality commercial streets

Retailed commerce activation

Areas with the lowest quality greenery

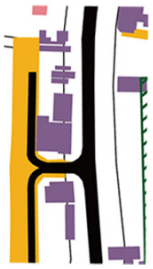
Ecological environment optimization

Areas with the lowest quality open space

Enhanced resident interaction

INTEGRATED INFRASTRUCTURE ANALYSIS

3



Cultural Social

4

Cultural Economic

5

Economic

6

Environmental

7

Cultural

8

Cultural Environmental

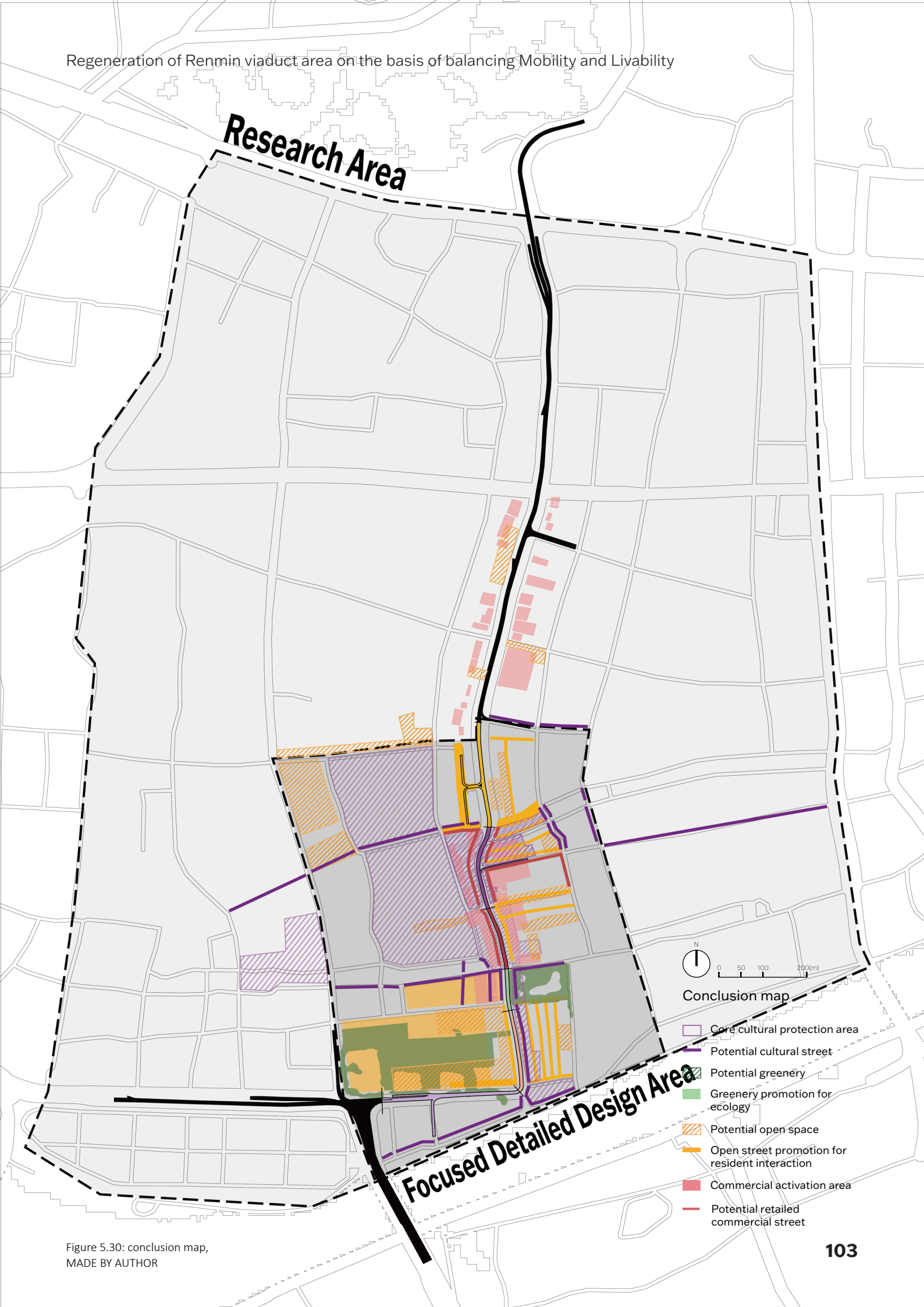


Figure 5.30: conclusion map,
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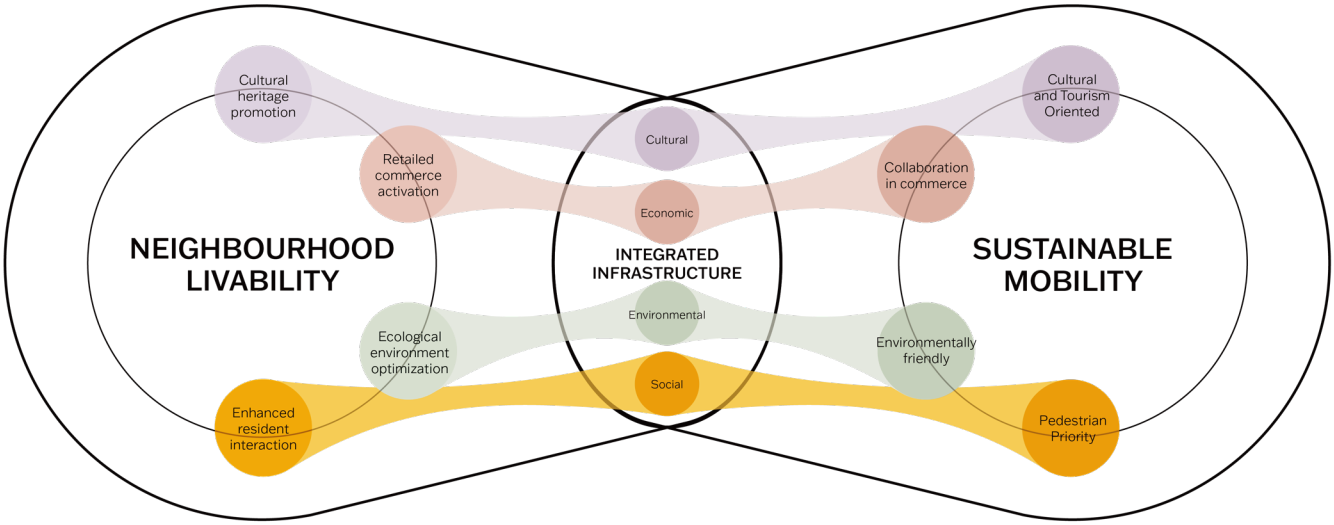
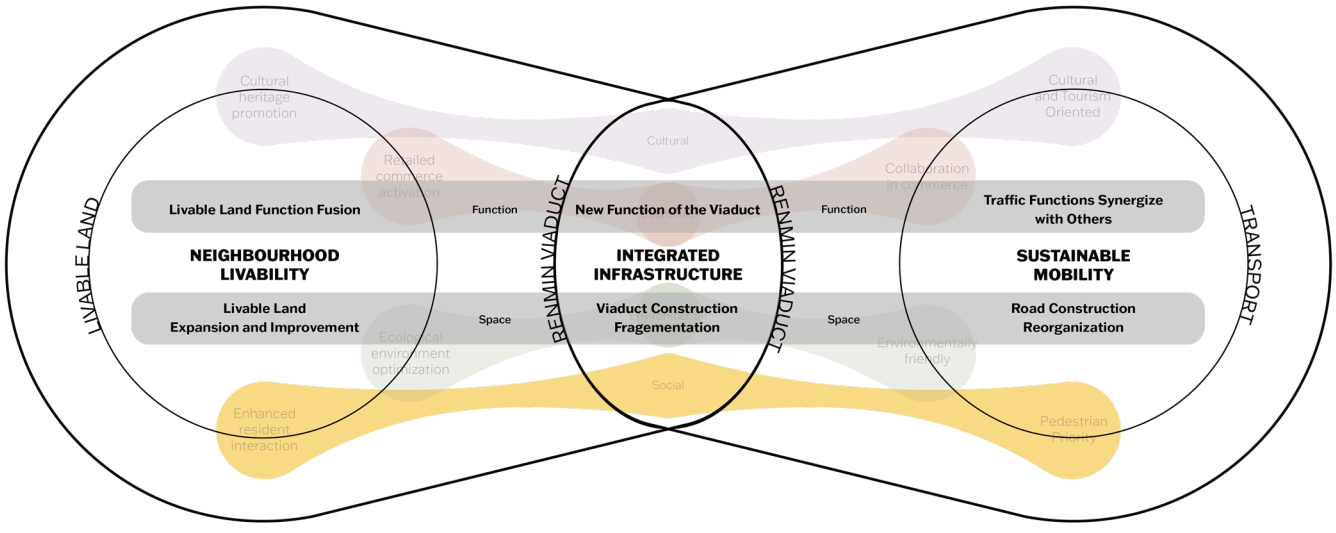
06

DESIGN PROPOSAL

Design proposal
DESIGN FRAMEWORK



Conceptual framework



Design framework

Urban Design
- spatial(form)
- functional(function)

In urban design, "form" and "function" are two fundamental concepts that relate to the physical and practical aspects of a city's layout and structure.

Form
"Form" in urban design refers to the physical attributes and aesthetics of the urban environment. This includes the shape, size, and arrangement of buildings, streets, public spaces, and infrastructure. Form encompasses the visual and spatial elements that define the character and identity of a place.

Function
"Function" in urban design refers to the practical uses and activities that take place within the urban environment. This involves how spaces are utilized and the roles they play in supporting the daily lives of residents and the operation of the city. Key aspects of function include:

"form" refers to the physical appearance and structure of urban spaces, while "function" refers to the practical uses and activities those spaces support. Together, they shape the overall experience and efficiency of the urban environment. In urban design, form and function are closely interrelated. Effective urban design seeks to create a harmonious balance between the two, ensuring that the physical form of the city supports and enhances its functional requirements.

In my project, I will achieve the three main design goals within the conceptual framework through the redesign of function and space. Therefore, each design goal will include two strategies: one focused on function and the other on space. And these strategies are derived from the four dimensions within each design goal.

Strategy

NEIGHBOURHOOD LIVABILITY

Spatial Strategy: Livable Land Expansion and Improvement

Functional Strategy: Livable Land Function Fusion

SUSTAINABLE MOBILITY

Functional Strategy: Traffic Functions Synergize with Others

Spatial Strategy: Road Construction Reorganization

INTEGRATED INFRASTRUCTURE

Functional Strategy: New Function of the Viaduct

Spatial Strategy: Viaduct Construction Fragementation

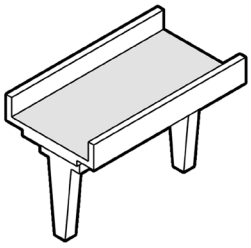
Design proposal
STRATEGIES FOR FUNCTION&SPACE

01 INTEGRATED INFRASTRUCTURE

Spatial Strategy: Viaduct Construction Fragementation

For Viaduct Surface

KEEP



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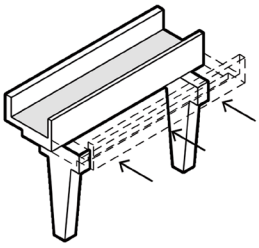

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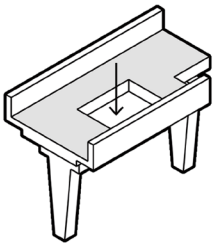
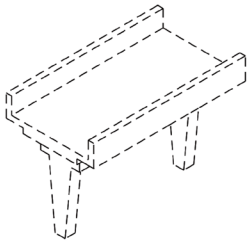
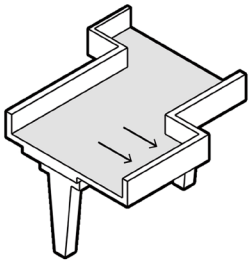


Digging

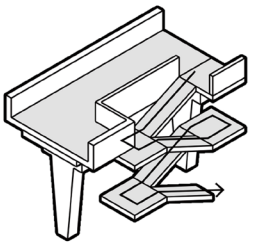
REMOVE



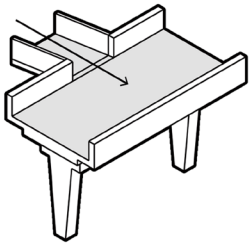
ADDING



Surface expanding



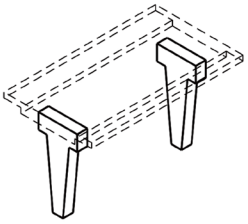
Stairs insertion



New entrance

For Viaduct Column

KEEP



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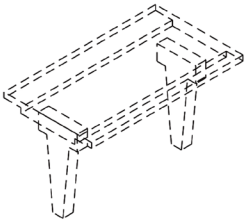
REMOVE



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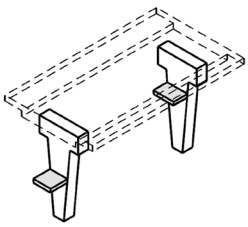
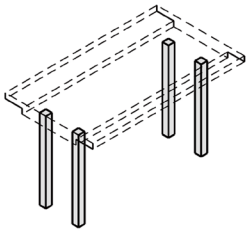
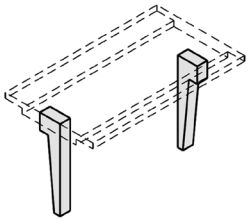


Vertical space



Replace



Partly retained

The development of this design toolbox is primarily based on conclusions drawn from the analysis of integrated infrastructure. These strategies offer solutions to address the challenges posed by the existing viaduct and enhance the urban environment. For instance, it is recommended to demolish sections of the viaduct to create open street spaces and eliminate the viaduct's threat to historical buildings. Additionally, more public spaces can be created both above and below the viaduct. Extending parts of the viaduct aims to connect different sites, facilitating better pedestrian flow. Moreover, structural modifications, such as partial demolition or creating new openings, can provide more sunlight and open space for the shops on both sides of the viaduct. This integrated approach ensures that the viaduct not only serves its transportation purpose but also contributes positively to the urban fabric by improving connectivity, accessibility, and the overall quality of public spaces.

This design toolbox illustrates various strategies for the fragmentation and modification of viaduct structures, focusing on both the viaduct surface and columns. The strategies are categorized into three main actions: keeping, removing, and adding.

For the viaduct surface:
Keeping: This involves either fully retaining the surface, partly retaining it by making adjustments, or digging to create new spaces while maintaining the overall structure.
Removing: This strategy involves completely removing sections of the viaduct surface to open up space or change its functionality.
Adding: This includes expanding the surface area, inserting stairs to create new access points, or adding new entrances to improve connectivity and usability.

For the viaduct columns:
Keeping: Columns can be fully retained, replaced with new ones, or partly retained with modifications to suit new design needs.
Removing: This involves the complete removal of columns, which could be necessary for creating open spaces or new pathways.
Adding: This includes adding vertical spaces or elements to the columns, enhancing their structural or aesthetic value and potentially creating new uses for the space.

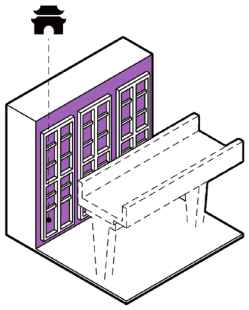
These strategies provide a comprehensive approach to transforming viaduct structures, making them more functional, accessible, and integrated with the urban environment.

Design proposal

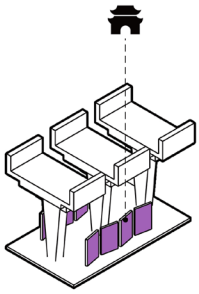
STRATEGIES FOR FUNCTION&SPACE

01 INTEGRATED INFRASTRUCTURE

Functional Strategy: New Function of the Viaduct



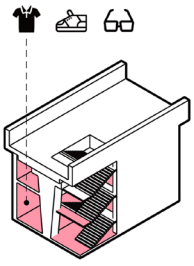
Cultural preservation



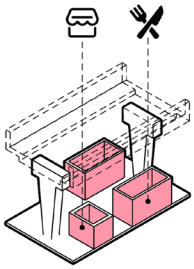
Cultural exhibition

Cultural and Tourism Oriented

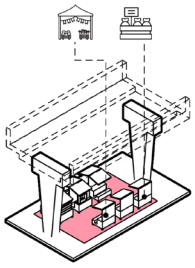
Cultural heritage promotio



Indoor Clothing Store



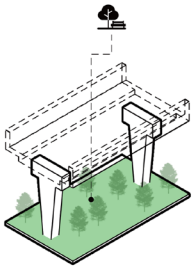
Outdoor Snack Bar



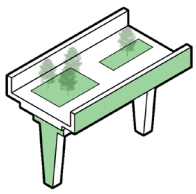
Outdoor Grocery

Collaboration in commerce

Retailed commerc activatio



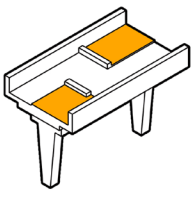
Garden under the bridge



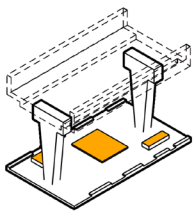
Vertical greenery

Environmentally friendly

Ecologica environme optimizati



Seat on the surface



Gathering under the bridge

Pedestrian Priority

Enhance resident interactio

This diagram outlines the proposed functional strategies for repurposing the viaduct, illustrating new uses that can enhance the area's livability and connectivity. The strategy emphasizes several key functions:

Cultural and Tourism Oriented Functions
Cultural Preservation: Utilizing parts of the viaduct for preserving cultural heritage.
Cultural Exhibition: Creating spaces for cultural displays and exhibitions to promote the area's rich history.

Commercial Collaboration:
Indoor Clothing Store: Establishing retail spaces under the viaduct to boost local commerce.
Outdoor Snack Bar and Grocery： Introducing outdoor commercial activities to activate the retail environment and enhance street life.

Environmental Friendliness:
Garden Under the Bridge: Developing green spaces beneath the viaduct to improve the ecological environment.
Vertical Greenery: Incorporating vertical gardens to optimize the ecological environment and provide aesthetic value.

Pedestrian Priority and Enhanced Resident Interaction:
Seating on the Surface: Providing seating areas on the viaduct for pedestrians to rest and interact.
Gathering Spaces Under the Bridge: Creating areas under the viaduct where residents can gather and socialize, enhancing community interaction.

Each proposed function is geared towards addressing specific goals such as cultural heritage promotion, commercial activation, ecological optimization, and enhancing pedestrian and resident interaction. By implementing these strategies, the viaduct can be transformed from a mere transportation structure into a multifunctional urban asset that significantly improves the quality of life for residents and visitors alike.

Design proposal

STRATEGIES FOR FUNCTION&SPACE

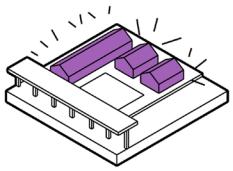
02 NEIGHBOURHOOD LIVABILITY

Spatial Strategy: Livable Land Expansion and Improvement

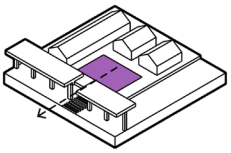
Cultural heritage promotion

CULTURAL SPACE AROUND VIADUCT

Current

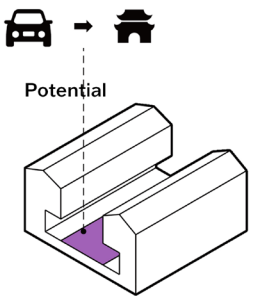


building preservation and repair

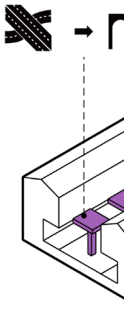


higher accessibility

Potential



wide streets to cultural space

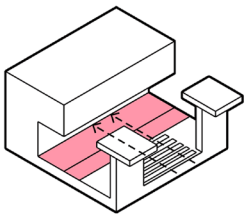


infrastr her

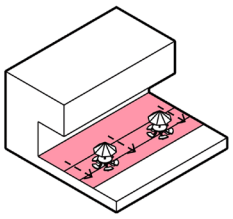
Retailed commerce activation

COMMERCIAL SPACE AROUND VIADUCT

Current

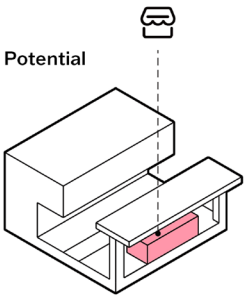


Higher accessibility

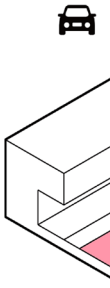


Outdoor commercial expanding

Potential



under bridge space to no-car commercial space

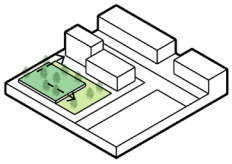


normal str comme

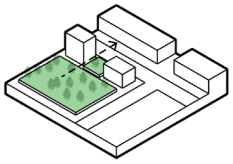
Ecological environment optimization

GREENERY AROUND VIADUCT

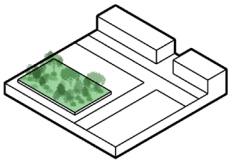
Current



Wider

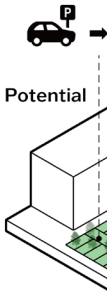


Higher accessibility



Landscape Design Optimization

Potential

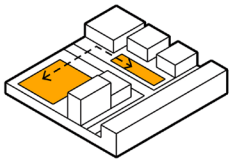


Parking lot t

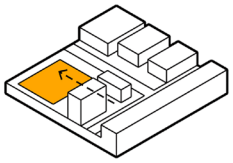
Enhanced resident interaction

OPEN SPACE AROUND VIADUCT

Current

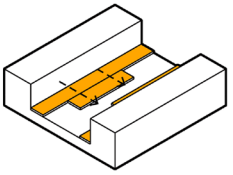


Wider

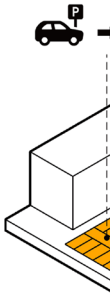


Higher accessibility

Potential



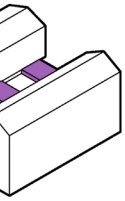
Wide streets to public space



Parking lot t

This diagram presents the spatial strategy for expanding and improving livable land around the viaduct, focusing on four main areas: cultural heritage promotion, commercial activation, ecological environment optimization, and enhanced resident interaction.

Cultural Heritage Promotion:
Current: Focuses on building preservation and repair to maintain cultural heritage.
Potential: Enhances accessibility to cultural spaces through wide streets and improved infrastructure, transforming infrastructure into heritage pathways.
Commercial Activation:
Current: Emphasizes higher accessibility and expanding outdoor commercial spaces.
Potential: Utilizes space under the bridge for no-car commercial activities, converting normal streets into pedestrian-friendly commercial streets.
Ecological Environment Optimization:
Current: Involves widening green areas and improving accessibility.
Potential: Optimizes landscape design, transforms parking lots into green spaces, and creates green belts along wider streets, converting some buildings into green spaces.
Enhanced Resident Interaction:
Current: Focuses on widening public spaces and improving accessibility.
Potential: Transforms wide streets and parking lots into public spaces, and removes buildings to create additional public areas.
Each of these strategies aims to improve the quality of life by creating more accessible, green, and interactive spaces around the viaduct, ultimately enhancing the overall livability of the area.



ucture to
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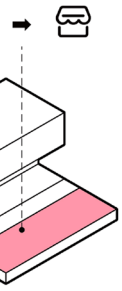
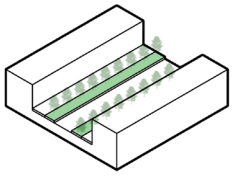
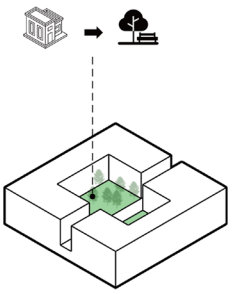


eet to no-car
rcial street

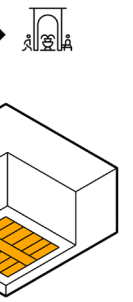
o green space



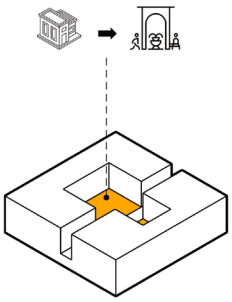
Green belts divided
on wider streets



Removing buildings into
green space



o public space



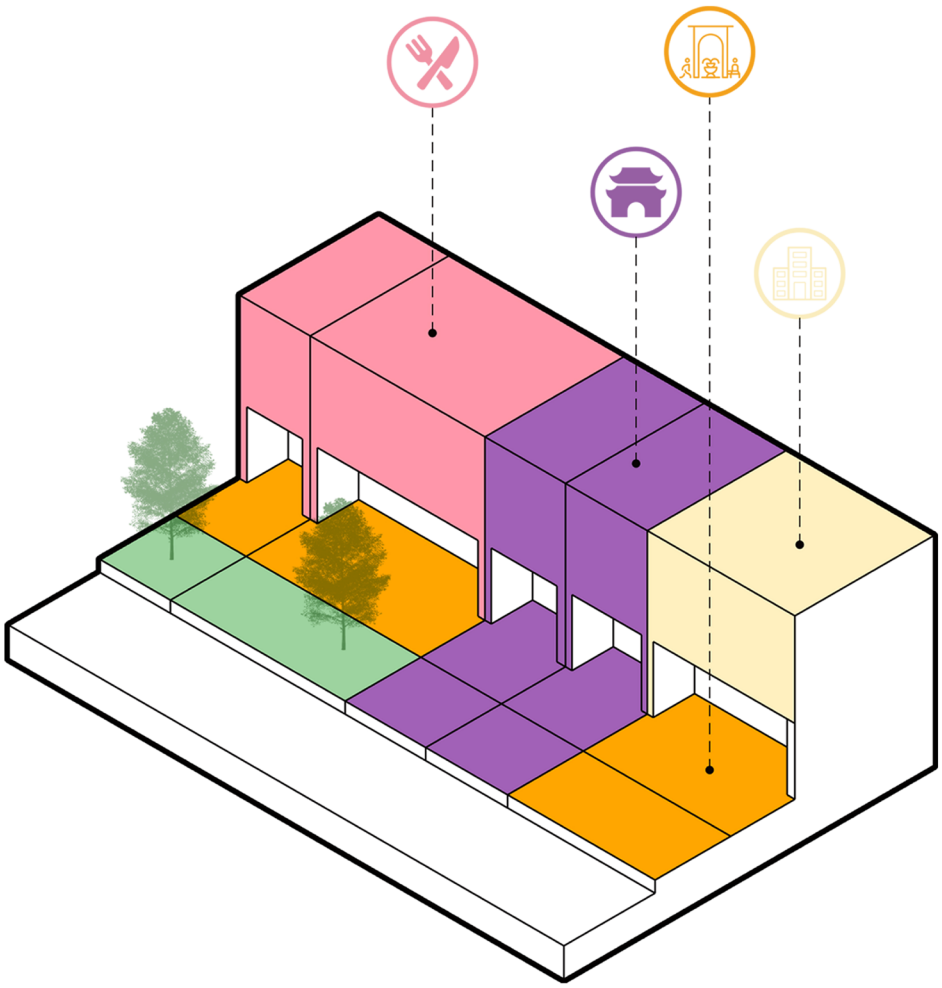
Removing buildings into public space

Design proposal

STRATEGIES FOR FUNCTION&SPACE

02 NEIGHBOURHOOD LIVABILITY

Functional Strategy: Livable Land Function Fusion



CULTURAL SPACE AROUND VIA

+

COMMERCIAL SPACE AROUND

+

GREENERY AROUND VIADUCT

+

OPEN SPACE AROUND VIADUCT

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VIADUCT

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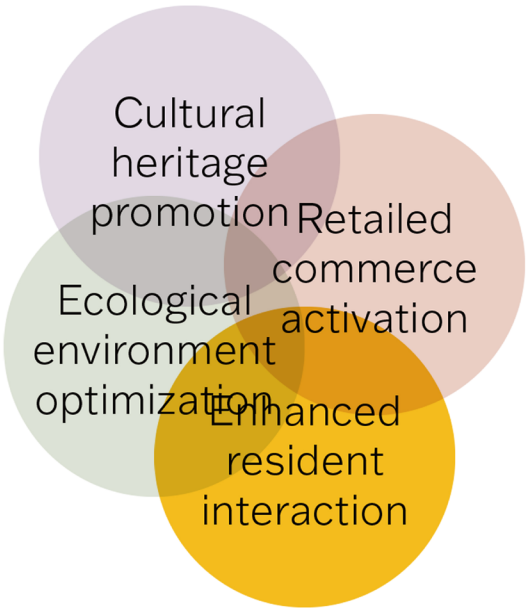


T

This diagram illustrates a comprehensive functional strategy to enhance the livability of the area around the viaduct by integrating various land functions. The strategy combines cultural spaces, commercial spaces, greenery, and open spaces to achieve multiple benefits. For cultural spaces, it promotes heritage preservation and accessibility, converting infrastructure to enhance access to cultural sites. In terms of commercial spaces, it improves accessibility and expands outdoor commercial activities, transforming spaces under the viaduct into no-car zones to enhance pedestrian-friendly areas. The greenery strategy enhances ecological value by widening green spaces and improving landscape design, converting parking lots into green areas, and adding green belts along wider streets. The open space strategy creates more accessible and wider public spaces, transforming parking lots and removing buildings to generate additional areas for social interactions. By fusing these components—cultural, commercial, greenery, and open spaces—the strategy aims to promote cultural heritage, activate commerce, optimize the ecological environment, and enhance resident interaction, resulting in a vibrant and multifunctional urban space that significantly improves the area's livability.

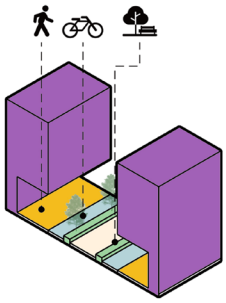
Design proposal

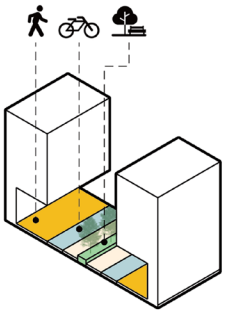
STRATEGIES FOR FUNCTION&SPACE

03 SUSTAINABLE MOBILITY

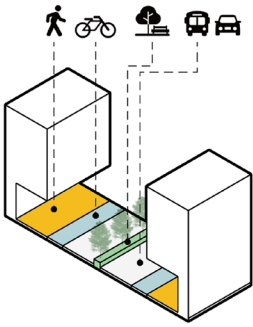
Spatial Strategy: Road Construction Reorganization

NO CAR STREET

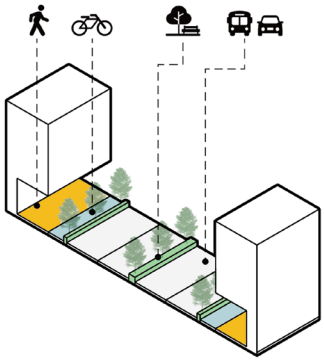




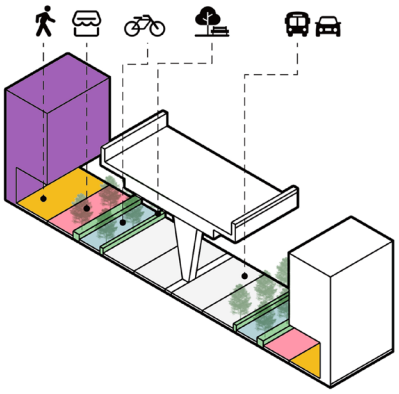
THIRD ROAD



SECONDARY ROAD

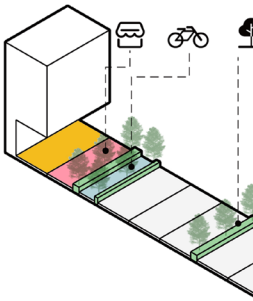


Without viaduct



With viaduct

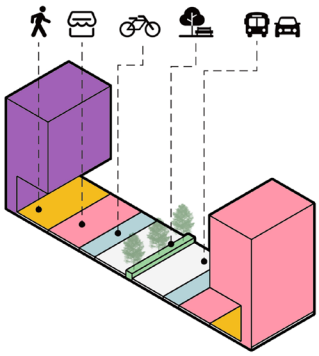
MAIN ROAD

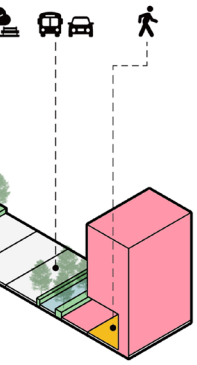


Cultural and Tourism Oriented

Collaboration in commerce

Environmentally friendly





Pedestrian Priority

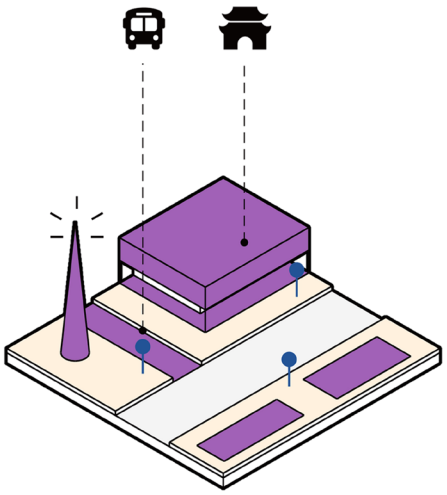
This diagram illustrates a comprehensive functional strategy to enhance the livability of the area around the viaduct by integrating various land functions. The strategy combines cultural spaces, commercial spaces, greenery, and open spaces to achieve multiple benefits. For cultural spaces, it promotes heritage preservation and accessibility, converting infrastructure to enhance access to cultural sites. In terms of commercial spaces, it improves accessibility and expands outdoor commercial activities, transforming spaces under the viaduct into no-car zones to enhance pedestrian-friendly areas. The greenery strategy enhances ecological value by widening green spaces and improving landscape design, converting parking lots into green areas, and adding green belts along wider streets. The open space strategy creates more accessible and wider public spaces, transforming parking lots and removing buildings to generate additional areas for social interactions. By fusing these components—cultural, commercial, greenery, and open spaces—the strategy aims to promote cultural heritage, activate commerce, optimize the ecological environment, and enhance resident interaction, resulting in a vibrant and multifunctional urban space that significantly improves the area's livability.

Design proposal

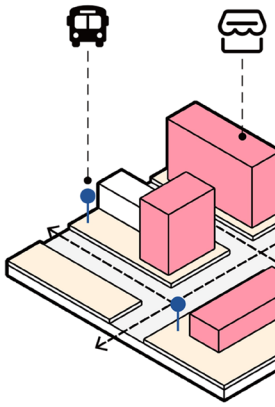
STRATEGIES FOR FUNCTION&SPACE

03 SUSTAINABLE MOBILITY

Functional Strategy: Traffic Functions Synergize with Others



Building cultural landmarks around transportation nodes or important transportation hubs in the city



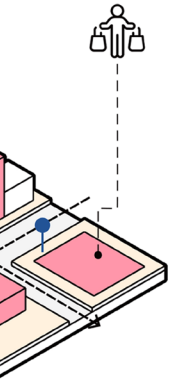
Connecting commercial public transportation hu easy access to pub services allows residen easily reach commercial the use of private autom

This diagram presents a functional strategy that synergizes traffic functions with other urban functions to enhance overall city livability. The strategy highlights four key aspects:

Cultural and Tourism Oriented: It involves building cultural landmarks around transportation nodes or significant transportation hubs in the city. This integration promotes cultural heritage while ensuring easy access for both residents and tourists, thus enhancing the area's attractiveness and usability.

Collaboration in Commerce: By connecting commercial centers to major public transportation hubs, this strategy ensures easy access to commercial areas, thereby reducing the reliance on private automobiles. This connectivity supports local businesses and makes commercial areas more accessible and vibrant.

Environmentally Friendly: The design and renovation of commercial areas to include sidewalks, bike lanes, additional landscaping, and improved intersection designs aim to make these areas more walkable and bikeable. This approach not only supports sustainable transportation modes but also enhances the environmental quality of the



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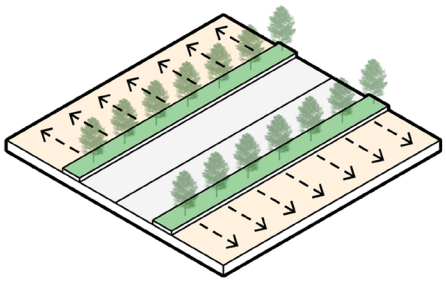
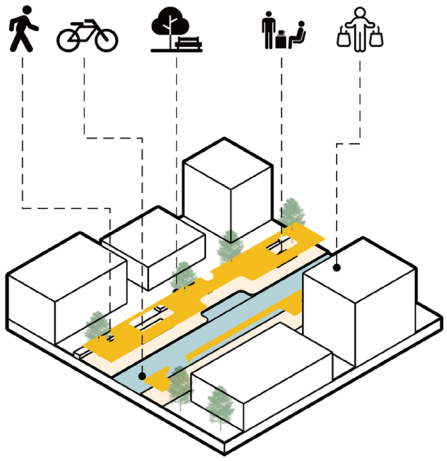


Environmentally friendly



Design and renovation of commercial areas to make them more walkable and bikeable, including construction of sidewalks, bike lanes, additional landscaping, improved intersection design, etc.

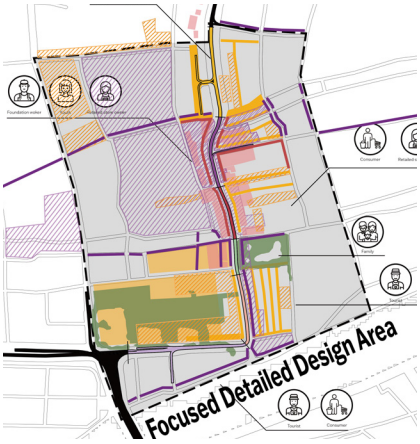
Pedestrian Priority

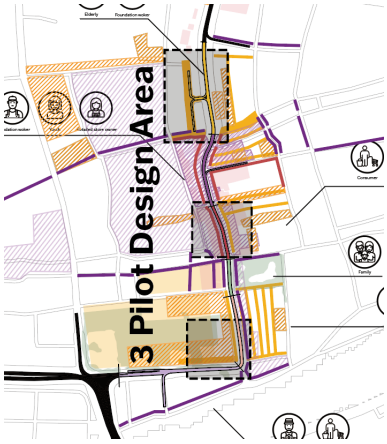
urban space.

Pedestrian Priority: Emphasizing pedestrian-friendly infrastructure ensures that public spaces are safe and inviting for walking. This involves creating wide streets for public use, converting parking lots into public spaces, and removing barriers to improve the flow and interaction of pedestrians.

By integrating these functions—cultural, commercial, ecological, and pedestrian—around traffic infrastructure, the strategy aims to create a harmonious and multifunctional urban environment. This approach not only enhances the functionality of the roads but also promotes cultural heritage, commercial vitality, environmental sustainability, and resident interaction.

Design proposal
STRUCTURE OF DESIGN OUTCOMES





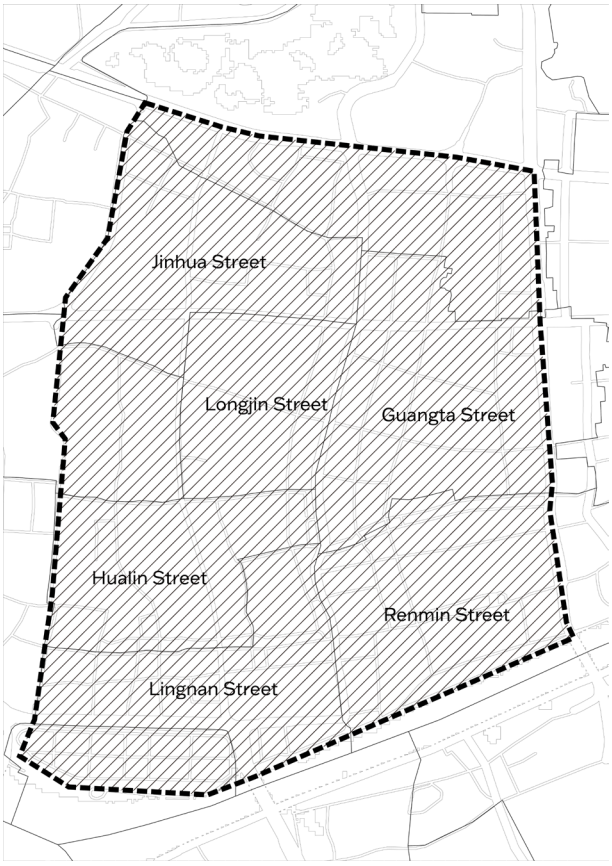
In addressing the redevelopment of the Renmin Viaduct, this urban planning initiative is structured around three distinct scales of intervention, each designed to address specific aspects of the urban landscape and user experience.

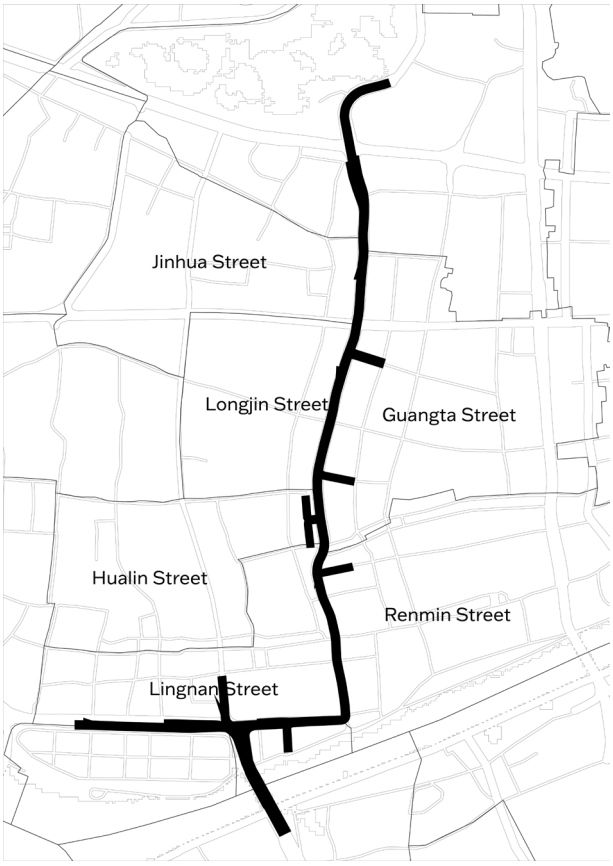
District-Scale Transportation Planning
This is the broadest scale, focusing on the comprehensive redevelopment of the entire transportation system within the Liwan and Yuexiu districts. The objective at this scale is to create a robust and resilient traffic network that accommodates changes induced by the transformation of the Renmin Viaduct. The planning here aims to enhance the overall efficiency of movement throughout the area, optimizing traffic flow and integrating different modes of transportation to support the urban growth and dynamic nature of Guangzhou.

Neighborhood-Scale Urban Design
At a more focused scale, the project treats the viaduct not just as a transportation structure but as a linear urban element that integrates with its surrounding urban fabric. The design includes the viaduct and adjacent areas, aiming to transform them into accessible and vibrant public spaces that serve both transportation and community functions. This scale of planning seeks to harmonize the viaduct's presence with commercial, cultural, and recreational activities, thereby fostering a multifunctional urban corridor that enhances connectivity and livability.

Street-Scale Detailed Design
The smallest scale focuses on human-scale interventions and the tactile experience of individuals interacting with the space. Here, the design emphasizes the architectural and structural aspects of the viaduct itself, considering its impact on street life and local neighborhoods. The goal is to enhance the pedestrian experience through detailed urban design interventions that address the quality of public spaces, accessibility, and the sensory experiences of the residents and visitors, ensuring that the viaduct supports vibrant street life and becomes a landmark in its own right.

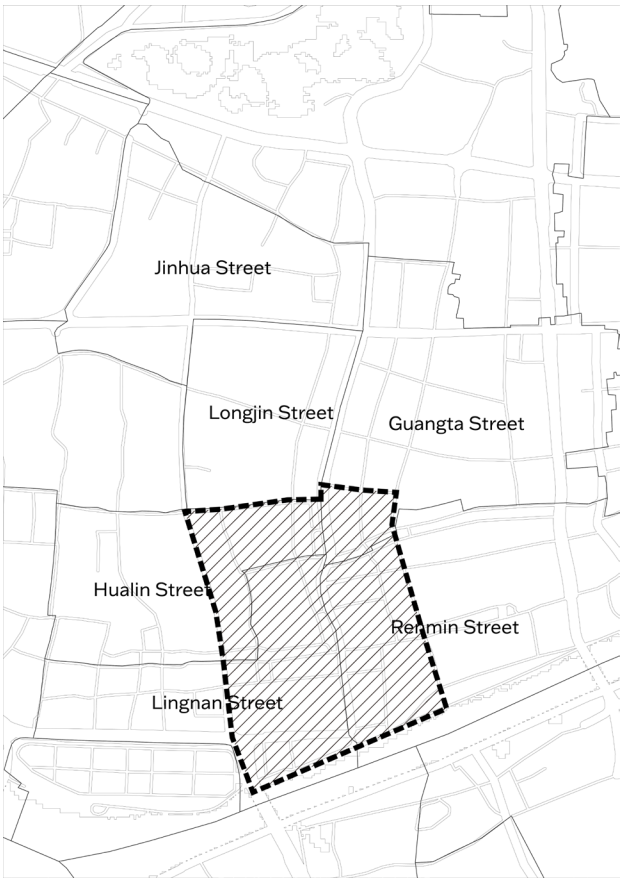
Together, these three scales of design work in concert to ensure that the transformation of the Renmin Viaduct contributes positively to the urban fabric of Guangzhou, enhancing the city's functionality and the quality of life for its citizens.





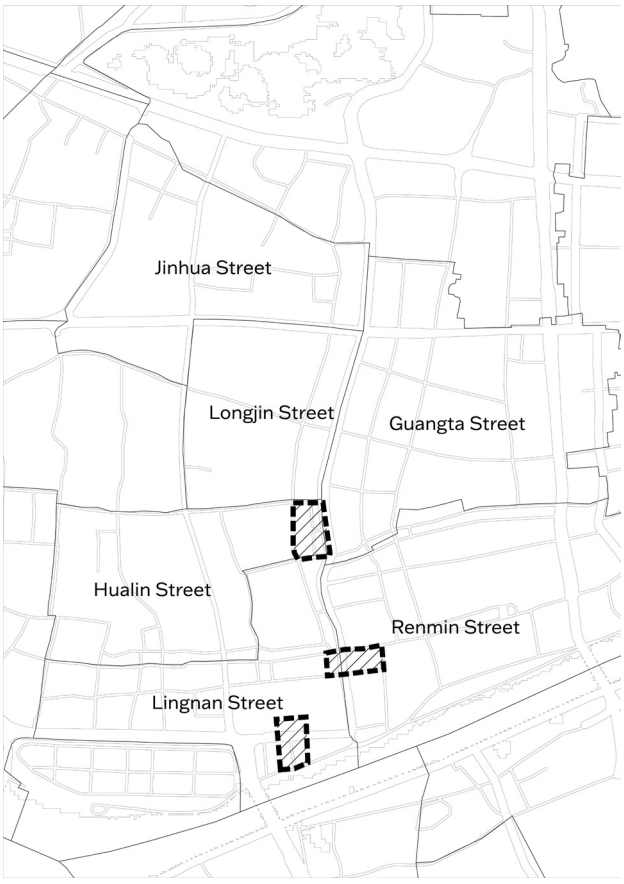
Transportation planning
for Renmin Viaduct and surrounding roads

LIWAN & YUEXIU DISTRICT SCALE



Master plan & Design implementation
for Renmin Viaduct reconstruction area

RENMIN ROAD NEIGHBOURHOOD SCALE



Detailed testing
for 3 streets with different qualities

STREET SCALE

07

DESIGN OUTCOMES


LINE 8
LINE 2
LINE 1
LINE 6
N
0 50 100 200(m)
Current Transportation
Viaduct
Main Road
Secondary Road
Third Road
Subway Station
Subway Line
Main Bus stop

Design outcomes

MASTER PLAN OF TRANSPORTATION DISTRICT SCALE

Current Transportation Layout

The current transportation map showcases the existing road and public transit infrastructure within the area. The viaduct, depicted in red, is a significant feature cutting through the urban landscape, predominantly serving vehicular traffic. This map highlights several main roads (in blue) that intersect with the viaduct, alongside secondary and tertiary roads that facilitate local traffic flow. The public transportation network is well-established, with multiple subway stations strategically located along the major subway lines (Lines 1, 2, 6, and 8), facilitating efficient transit across and beyond the city. Main bus stops are also strategically placed to serve the commuters effectively, ensuring connectivity between various modes of transportation.

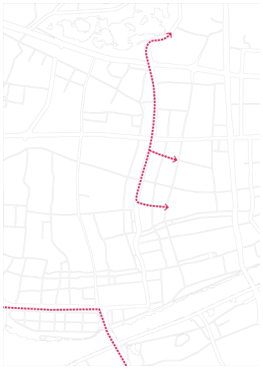
Design outcomes
MASTER PLAN OF TRANSPORTATION DISTRICT SCALE

SUSTAINABLE MOBILITY

Functional Strategy: Traffic Functions Synergize with Others

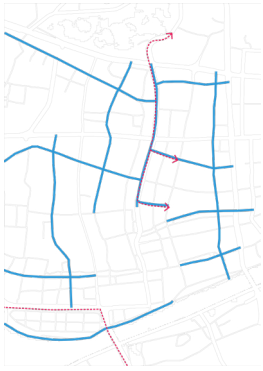
Spatial Strategy: Road Construction Reorganization

Proposed Transportation Planning



The **southern part of the viaduct** will be dismantled and renovated, no longer accommodating vehicular traffic.

The **main roads** on both sides of the viaduct will be reinforced to secondary road and third road to accommodate more traffic flow.



The main road under the viaduct will be downgraded to **secondary roads and third roads.**

Other **third roads** will be improved.

No-car streets will be implemented to accommodate pedestrian traffic around the southern part of the viaduct.

Restructuring of the Viaduct: The viaduct's function is diversified to support not just vehicular traffic but also pedestrian activities. This restructuring aims to reduce the barrier effect created by the existing viaduct, integrating it more seamlessly into the urban fabric.

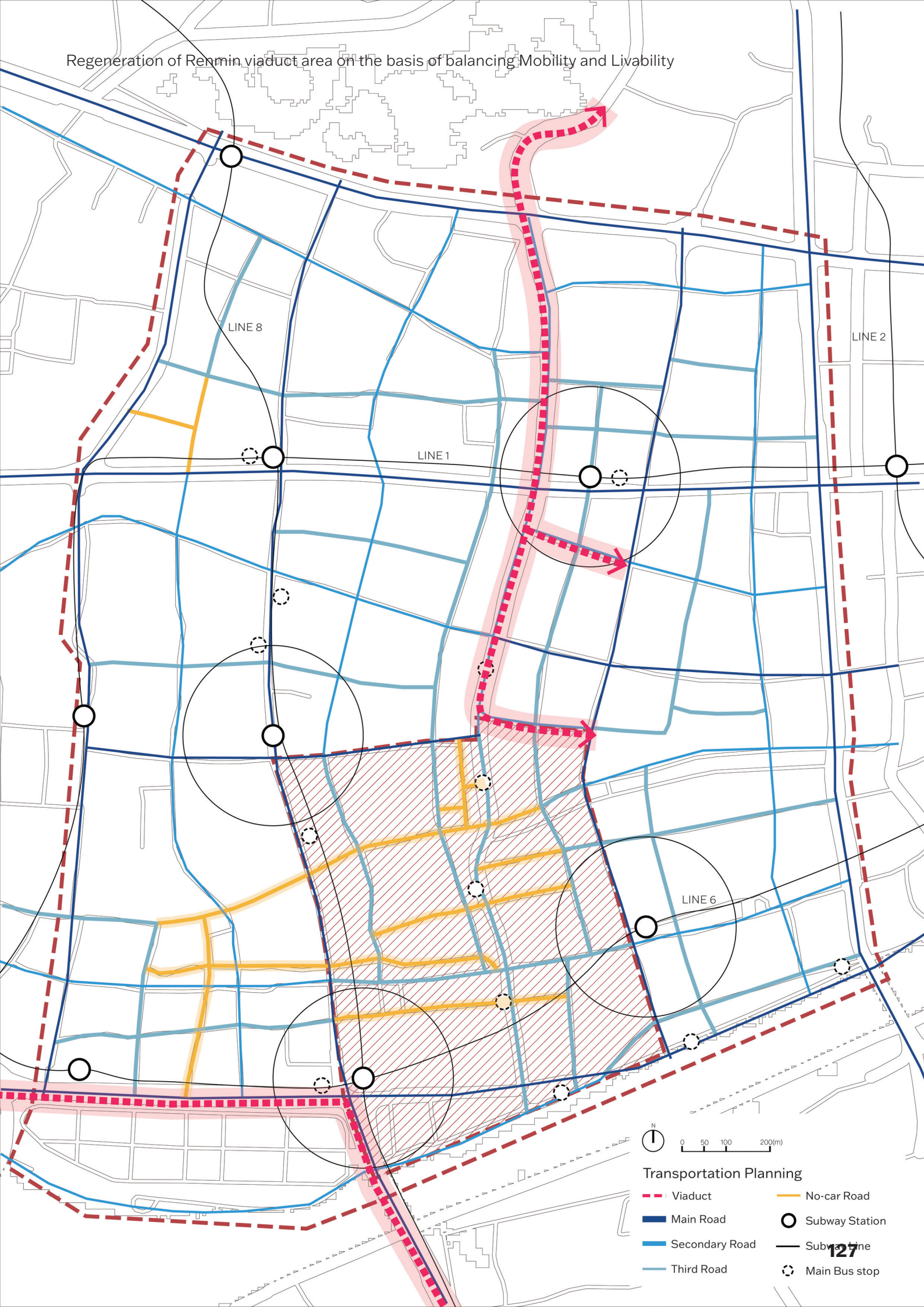
Introduction of No-car Roads: New no-car zones (marked in yellow) are introduced, promoting pedestrian priority and bicycle-friendly paths. These areas are designed to encourage walking and cycling, reducing dependence on motor vehicles and enhancing the urban living environment.

Reorganization of Traffic Flow: Main roads are reconfigured to optimize traffic flow, incorporating dedicated lanes for buses and bicycles to improve efficiency and safety. This reorganization helps in managing traffic density, particularly around busy intersections and transit hubs.

Expansion of Public Transit Access: The subway lines are extended, and new stations are added to underserved areas (as indicated by the orange lines), increasing the reach and effectiveness of public transportation. This expansion helps in decongesting overly crowded routes and promotes the use of public transit as a primary mode of transport.

Enhanced Connectivity Between Different Transportation Modes: Improved integration of bus stops and subway stations ensures seamless transfers between different modes of transportation, facilitating easier and quicker commutes for the public.

Overall, the proposed transportation planning is focused on creating a more integrated, efficient, and sustainable transportation network that supports the broader goals of urban development and livability. It aims to transform the current car-centric infrastructure into a more pedestrian and environmentally friendly system, promoting a shift towards sustainable urban mobility patterns.


LINE 8
LINE 1
LINE 2
LINE 6
N
0 50 100 200(m)
Transportation Planning
Viaduct
Main Road
Secondary Road
Third Road
No-car Road
Subway Station
Subway Line
Main Bus stop

Design outcomes

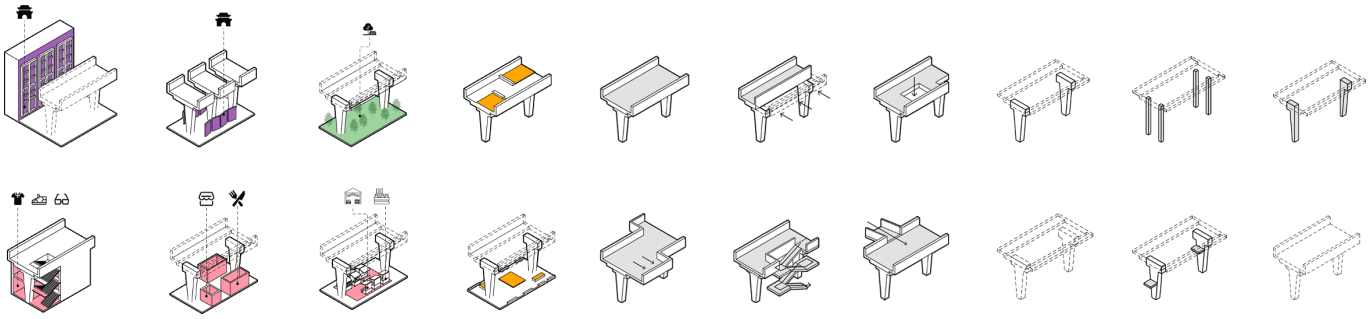
IMPLEMENTATIONS FOR NEIGHBOURHOOD SCALE

Integrated infrastructure plan

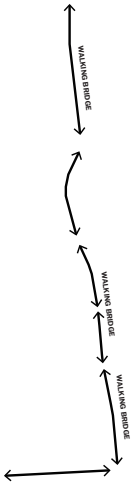
INTEGRATED INFRASTRUCTURE

Functional Strategy: New Function of the Viaduct

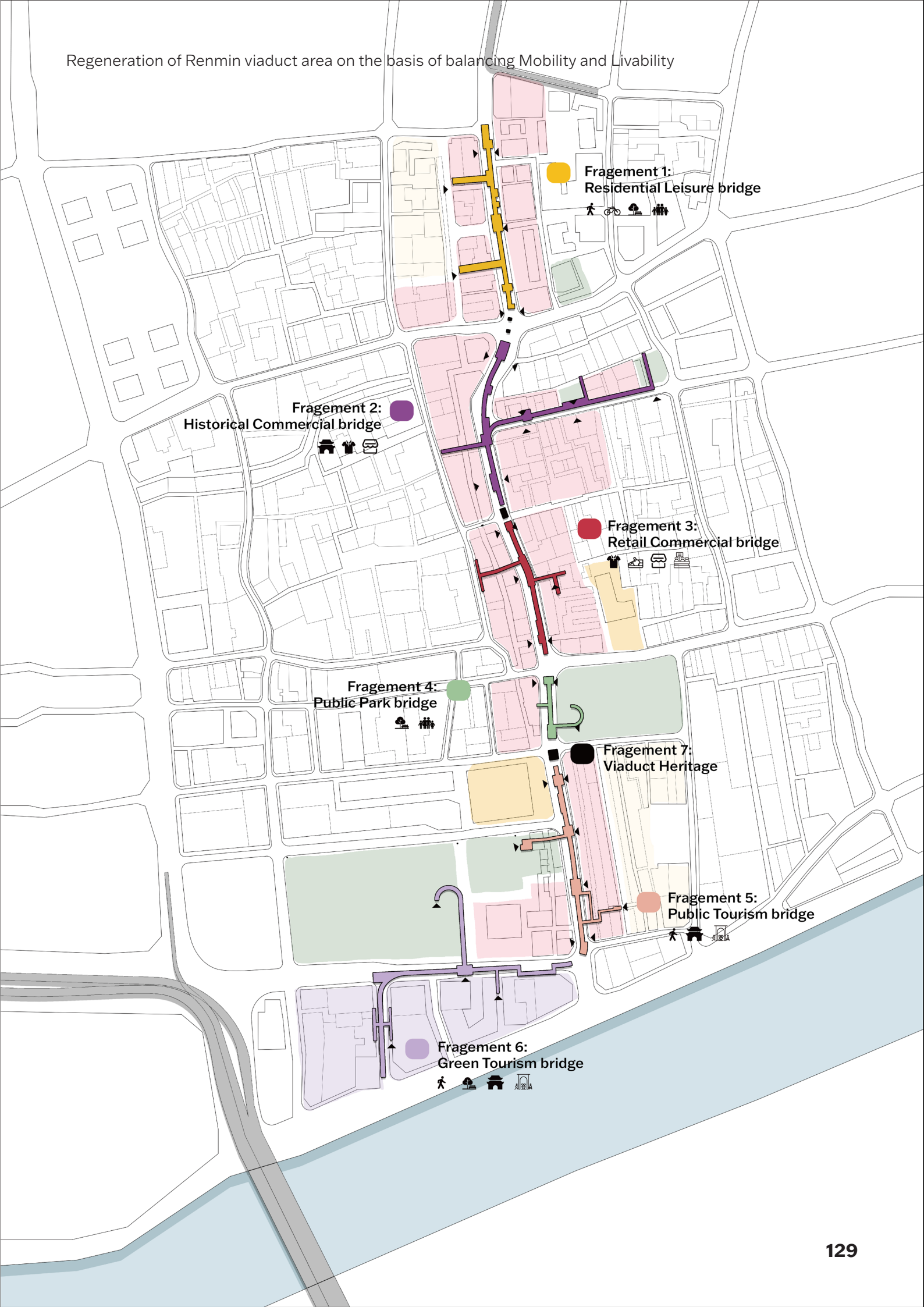
Spatial Strategy: Viaduct Construction Fragementation



The Residential Leisure Bridge (Fragment 1) focuses on creating open spaces for residents' leisure activities by removing parts of the viaduct. The Historical Commercial Bridge (Fragment 2) aims to preserve historical commercial resources while extending bridges to connect historical sites and shops, utilizing the space under the bridge for cultural exhibitions and retail. The Retail Commercial Bridge (Fragment 3) plans to increase sunlight and open space by structural retreat and bridge extension, setting up retail shops to activate commercial potential. The Public Park Bridge (Fragment 4) emphasizes ecological improvement through blue-green infrastructure modifications and bridge extensions to enhance the accessibility and quality of park green spaces. The Public Tourism Bridge (Fragment 5) and Green Tourism Bridge (Fragment 6) aim to improve connectivity to historical cultural resources and green spaces, protecting historical buildings, adding cultural exhibitions, and tourism retail through structural retreats and bridge extensions. The Viaduct Heritage Bridge (Fragment 7) and Cultural Tourism Bridge (Fragment 8) focus on the protection and display of historical cultural heritage, enhancing the viaduct's visual appeal and cultural value.



plan structure


Fragement 1:
Residential Leisure bridge
Fragement 2:
Historical Commercial bridge
Fragement 3:
Retail Commercial bridge
Fragement 4:
Public Park bridge
Fragement 7:
Viaduct Heritage
Fragement 5:
Public Tourism bridge
Fragement 6:
Green Tourism bridge

Design outcomes

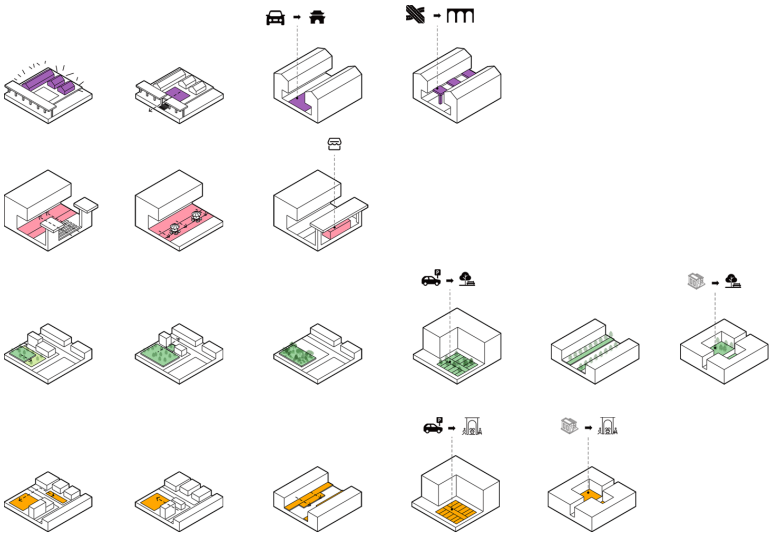
IMPLEMENTATIONS FOR NEIGHBOURHOOD SCALE

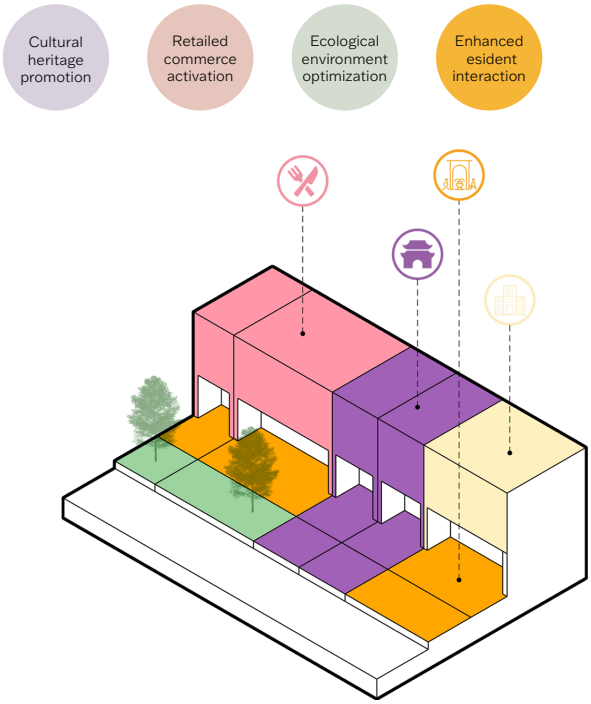
Neighbourhood livability plan

NEIGHBOURHOOD LIVABILITY

Spatial Strategy: Livable Land Expansion and Improvement

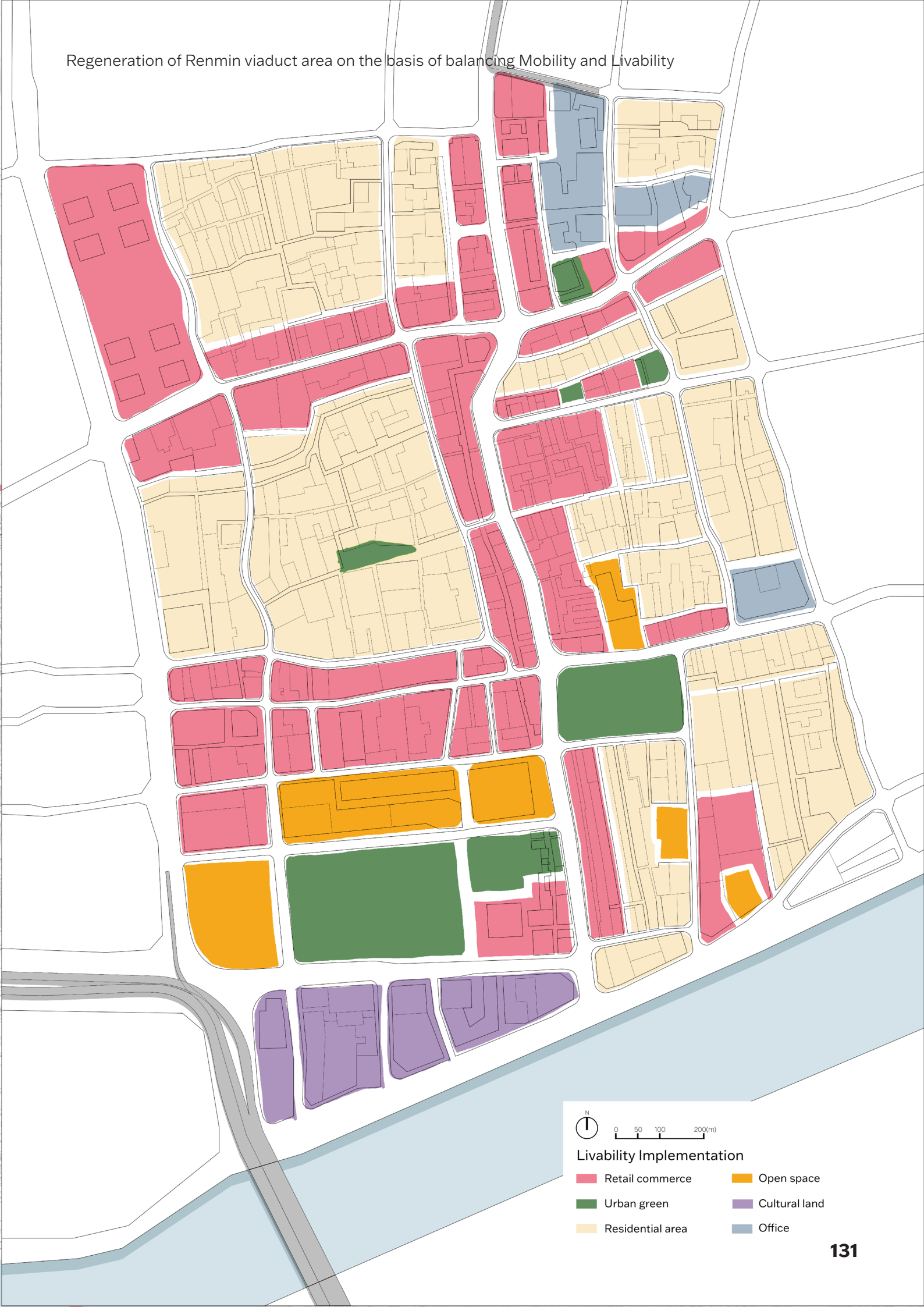
Functional Strategy: Livable Land Function Fusion





The map shows the retail business area (red), urban green space (green), residential area (beige), open space (orange), cultural land (purple) and office area (blue). In the layout of the retail business area, the concentration and coherence of commercial facilities are emphasized, especially near major transportation nodes, to facilitate daily shopping and consumption of residents and tourists. The increase and optimization of urban green space and open space not only improves the ecological environment of the area, but also provides residents with more leisure and social places. By setting up urban green space around the viaduct to form a green buffer zone, the impact of traffic on residents' lives is effectively reduced. At the same time, by increasing cultural land and office areas, the cultural atmosphere and employment opportunities of the area are improved, making the area more diversified. Overall, the plan significantly improves the livability of the Renmin Road Viaduct area by optimizing the layout of different functional areas and improving the quality of public spaces, creating a more attractive and vibrant urban environment.

plan structure


N
0 50 100 200(m)
Livability Implementation
Retail commerce
Open space
Urban green
Cultural land
Residential area
Office

Design outcomes

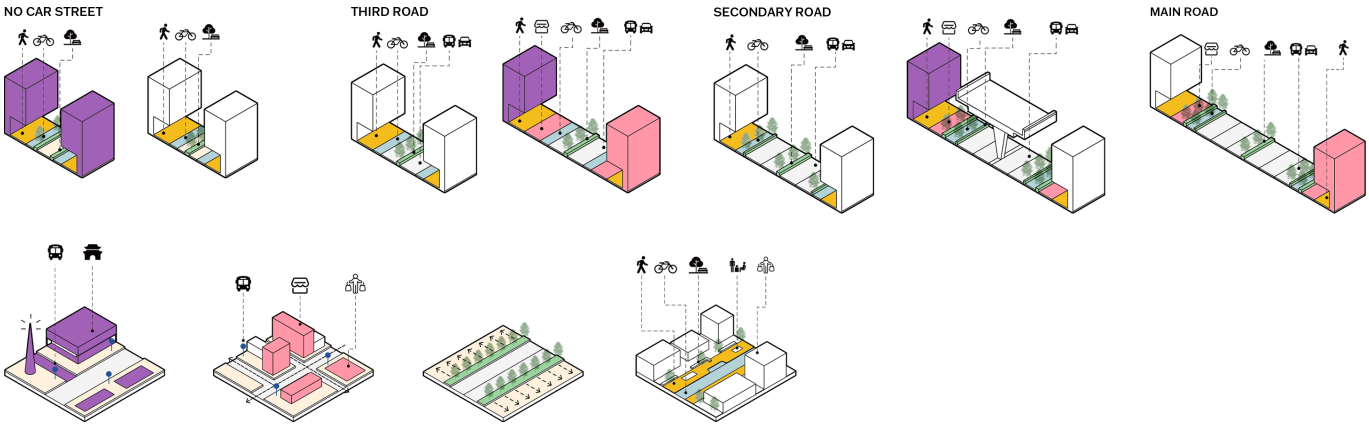
IMPLEMENTATIONS FOR NEIGHBOURHOOD SCALE

Sustainable mobility plan

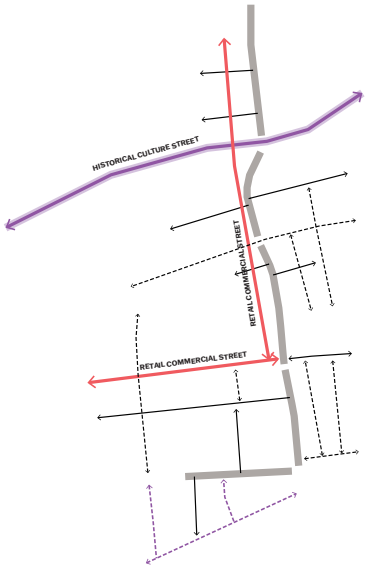
SUSTAINABLE MOBILITY

Functional Strategy: Traffic Functions Synergize with Others

Spatial Strategy: Road Construction Reorganization



There are several major problems with the current traffic, so I conducted a new traffic plan to achieve sustainability. Specifically, the traffic adjustment and optimization of the viaduct area includes the following aspects: First, the main roads (blue lines) and secondary roads (light blue lines) are mainly concentrated in areas outside the viaduct to ensure the smooth flow of the main roads and connect important transportation nodes and urban areas, while the secondary roads cover a wider range of community areas to enhance the density and connectivity of the transportation network. Secondly, the third-level roads (yellow lines) are distributed on both sides of the viaduct, especially in the southern area, to divert traffic pressure from the main roads and connect secondary commercial and residential areas. In addition, the plan also includes car-free roads (orange lines) and retail logistics lines (pink lines). Car-free roads are designed to improve the convenience of walking and non-motorized vehicles, while retail logistics lines optimize the transportation of goods in commercial areas. Ultimately, these adjustments not only improve traffic flow, but also enhance the quality of life of residents and the accessibility of public spaces.



plan structure

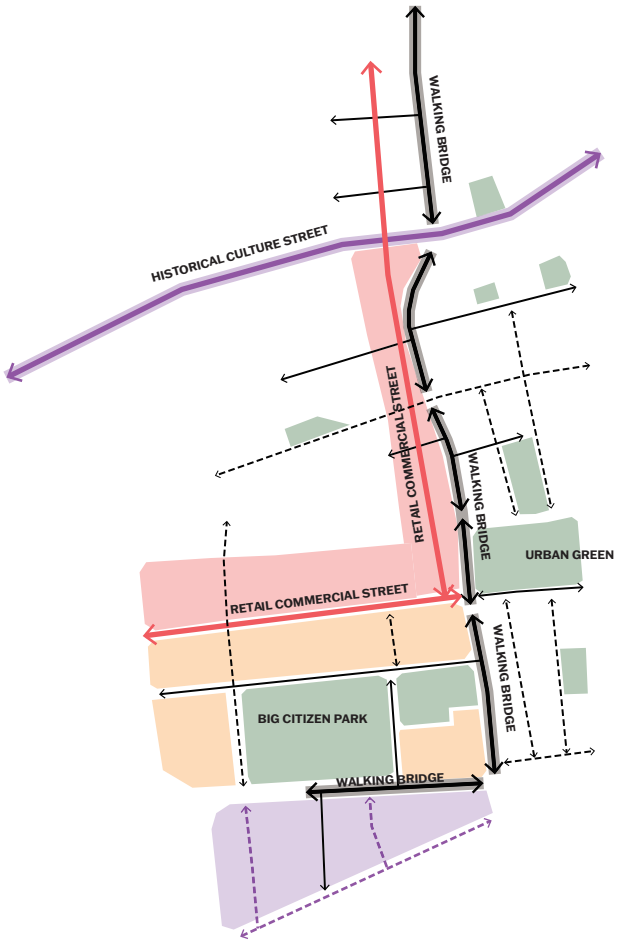

N
0 50 100 200(m)
Mobility Implementation
Main Road
Secondary Road
Third Road
No-car Road
Preserved surface parking lot
Removed surface parking lot
Retail Logistics Line
Retail Unloading Point

Design outcomes

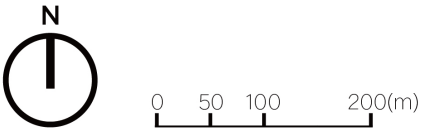
IMPLEMENTATIONS F
NEIGHBOURHOOD S(

Conclusion master plan

Mobility Design implementation
+
Infrastructure Design implementation
+
Livability Design implementation

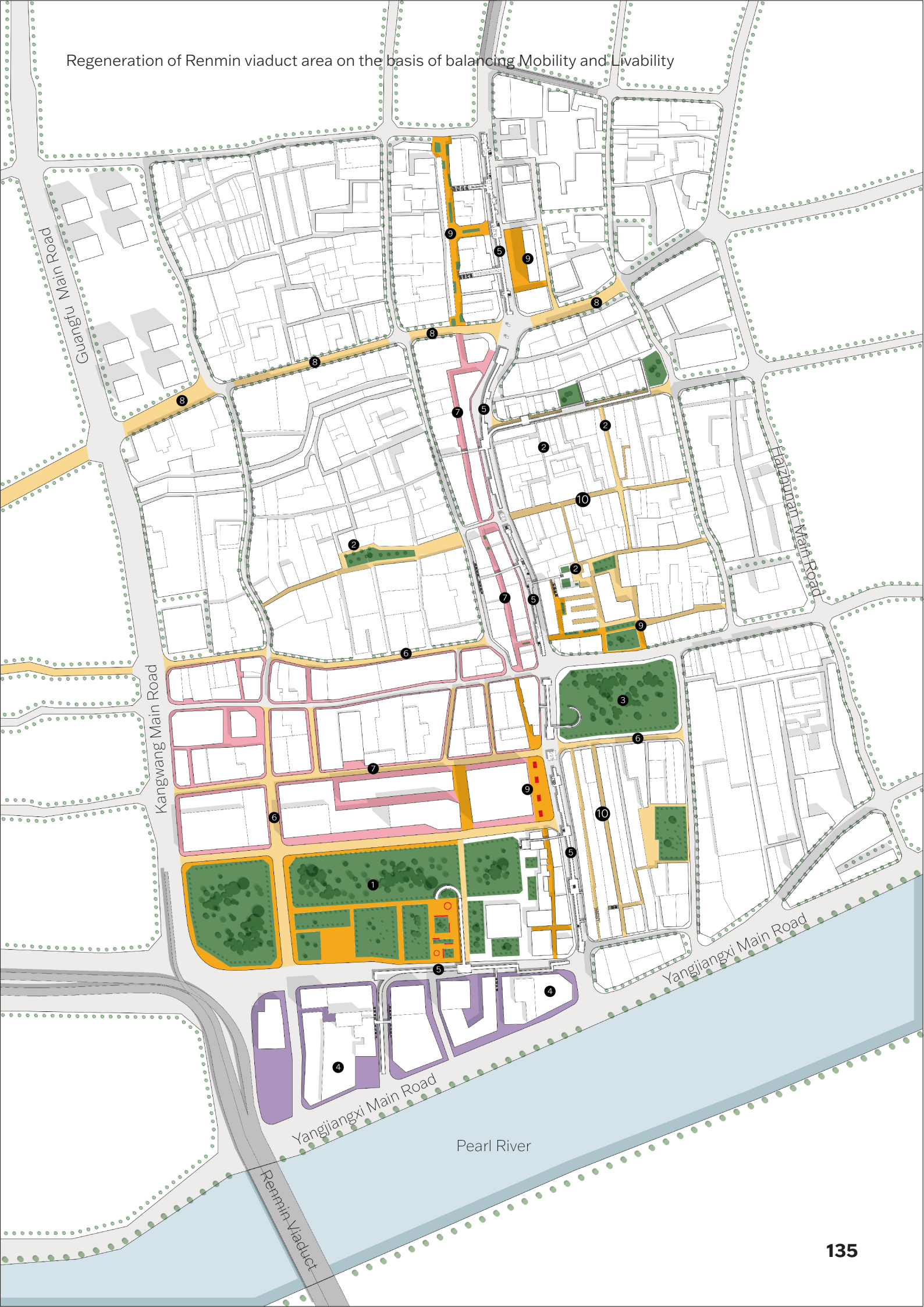


plan structure



Master Plan

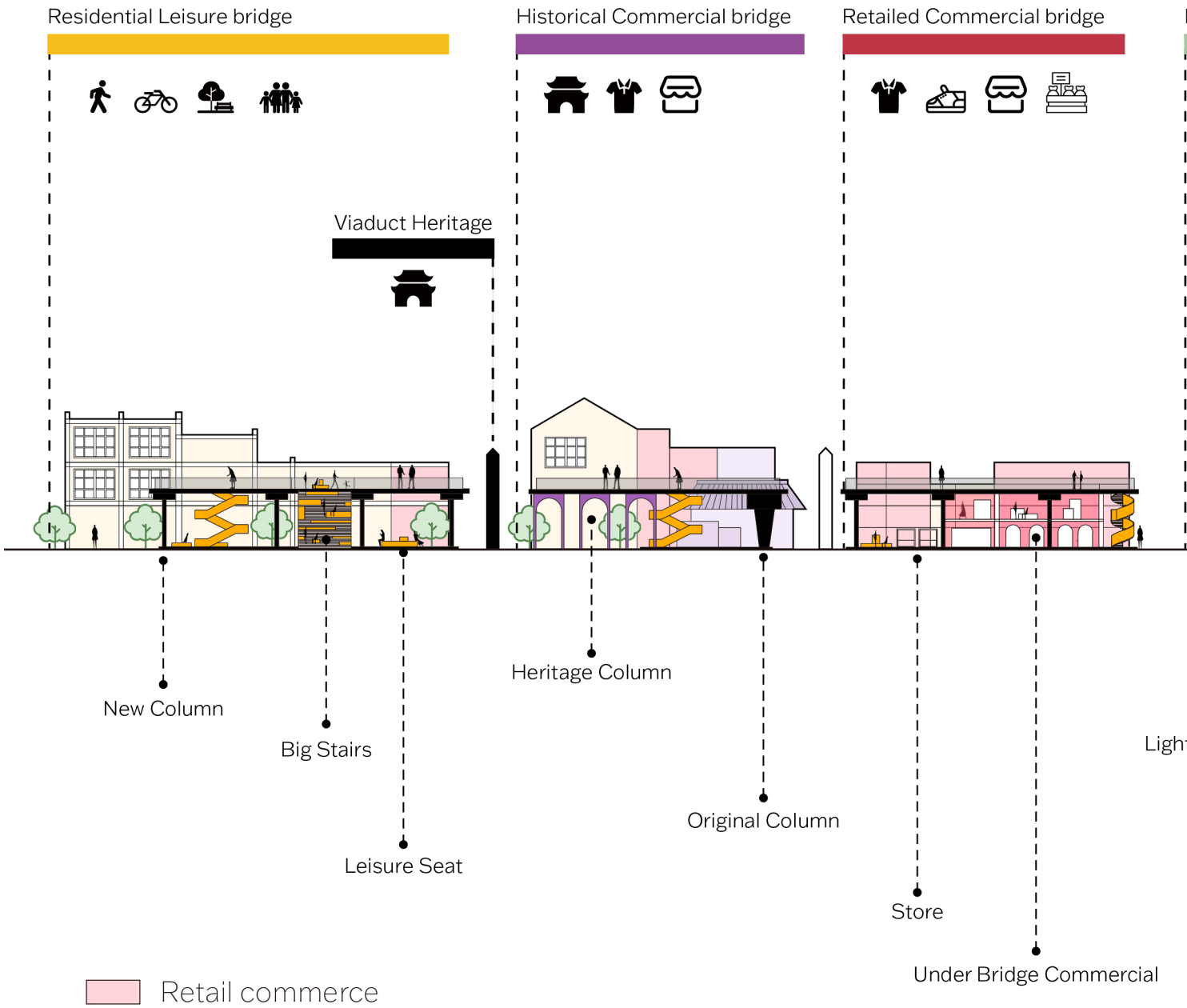
1. City Park
2. Pocket Park
3. Family Park
4. Cultural Scenery
5. Walking Bridge
6. No-car Street
7. Retailed Commercial Street
8. Historical Culture Street
9. Residents Square
10. Residents Living Street

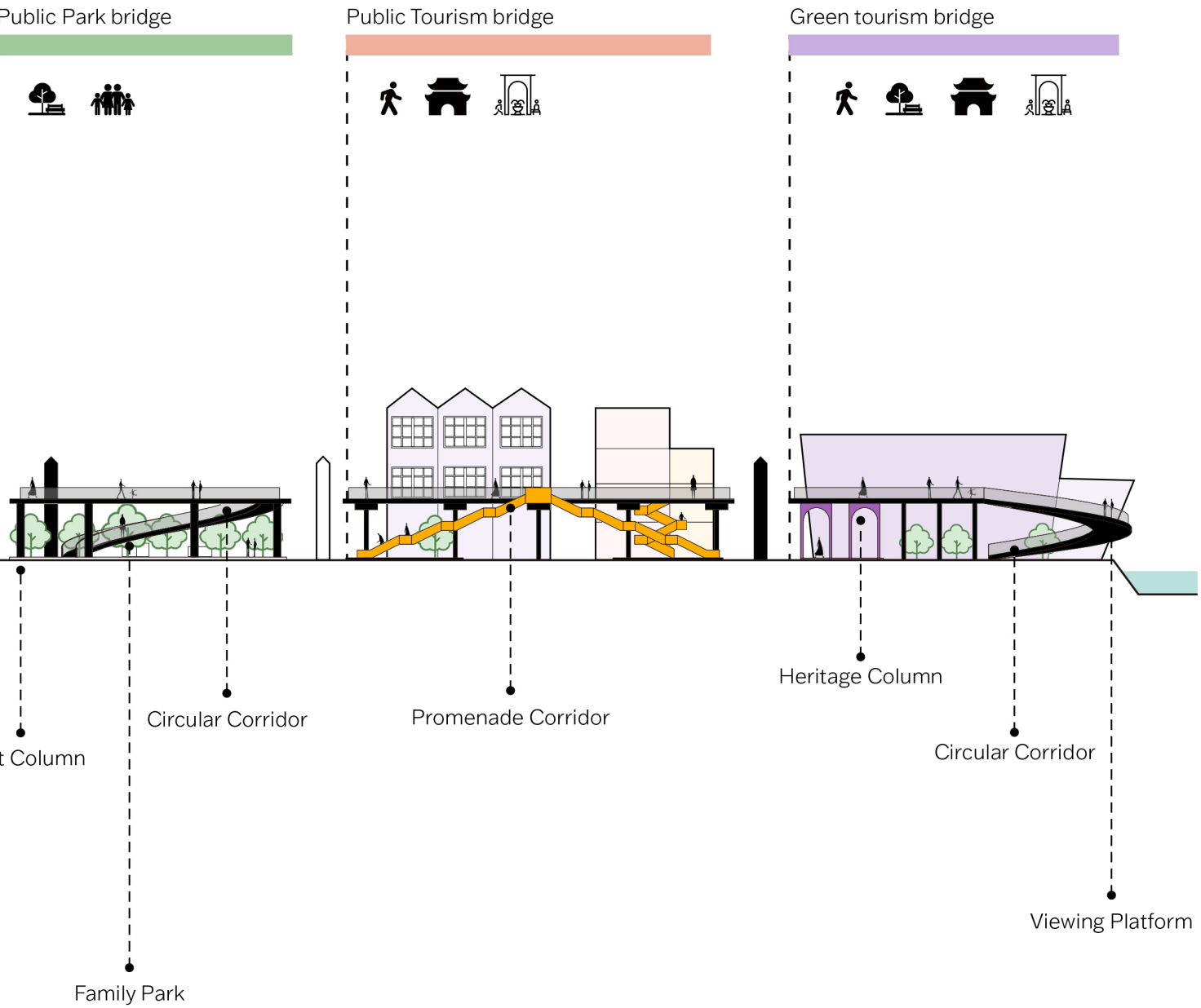

Guangfu Main Road
Kangwang Main Road
Haizhuqu Main Road
Yangjiangxi Main Road
Yangjiangxi Main Road
Pearl River
Renmin Viaduct

Design outcomes

IMPLEMENTATIONS FOR NEIGHBOURHOOD SCALE

Conclusion scheme section



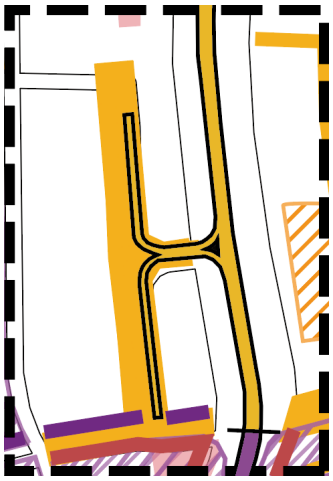

Public Park bridge
Public Tourism bridge
Green tourism bridge
t Column
Circular Corridor
Promenade Corridor
Heritage Column
Circular Corridor
Viewing Platform
Family Park

Design outcomes

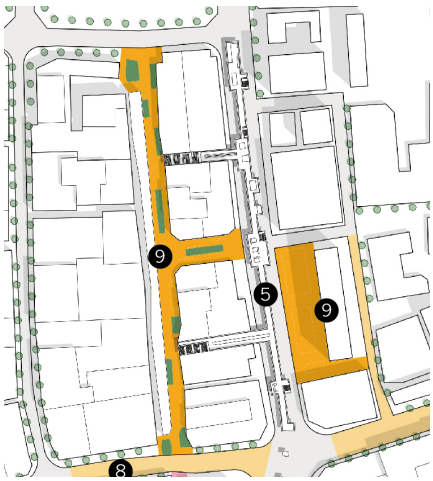
PILOT EXPLORATION ON STREET SCA

Site 1: Residential leisure

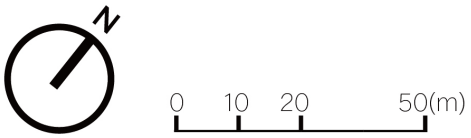
Status quo



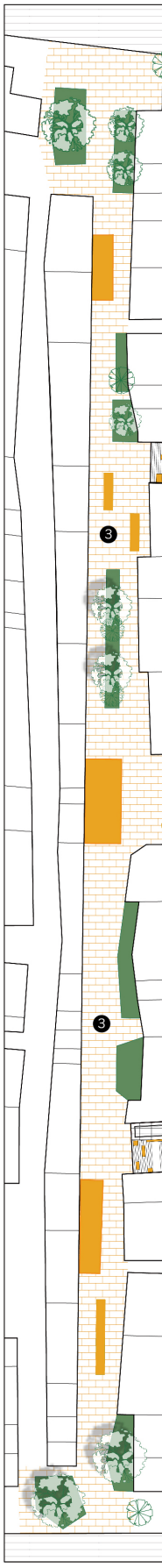
Master plan



The Residential Leisure Bridge design aims to transform the viaduct into a multi-functional infrastructure, focusing on social and cultural enhancement. Key strategies include removing parts of the viaduct to create open street spaces, integrating more public areas above and below the bridge, and improving connectivity for pedestrians. This design will provide new leisure and recreational spaces, enhance the quality of life for residents, and protect nearby historical buildings from the negative impact of the viaduct.



- Greenery
- Public space
- Street funiture
- Bicycle lane
- Car lane
- Walking bridge
- 1 Big stairs
- 2 Residents Square
- 3 Residents Living Street
- 4 Exit&Entrance



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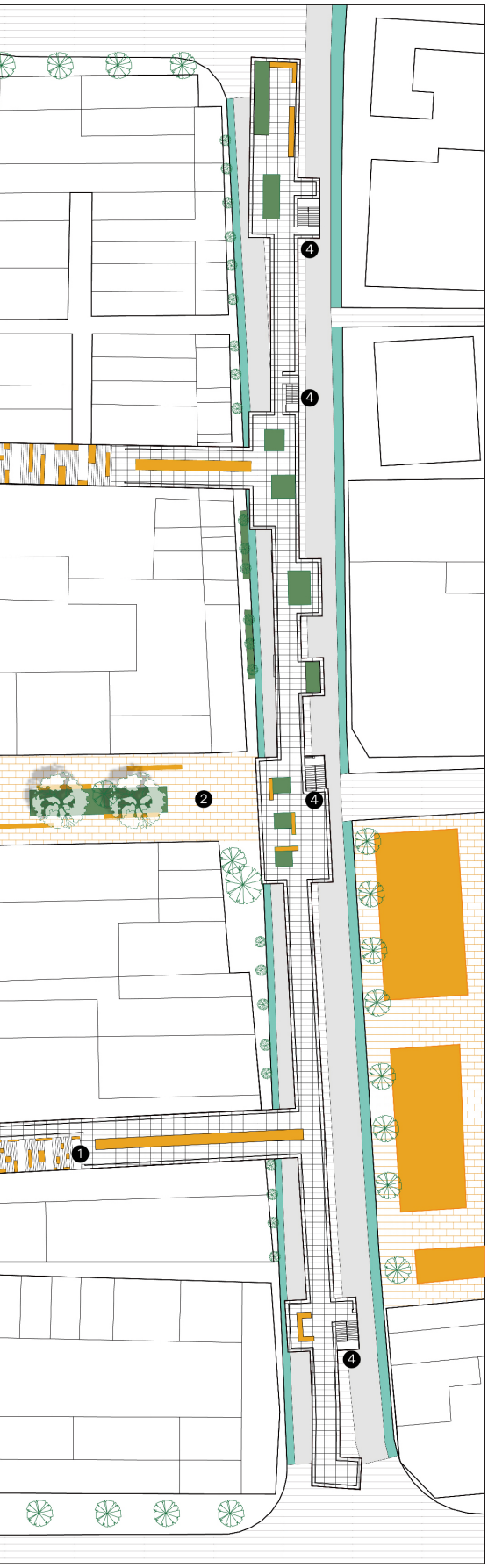
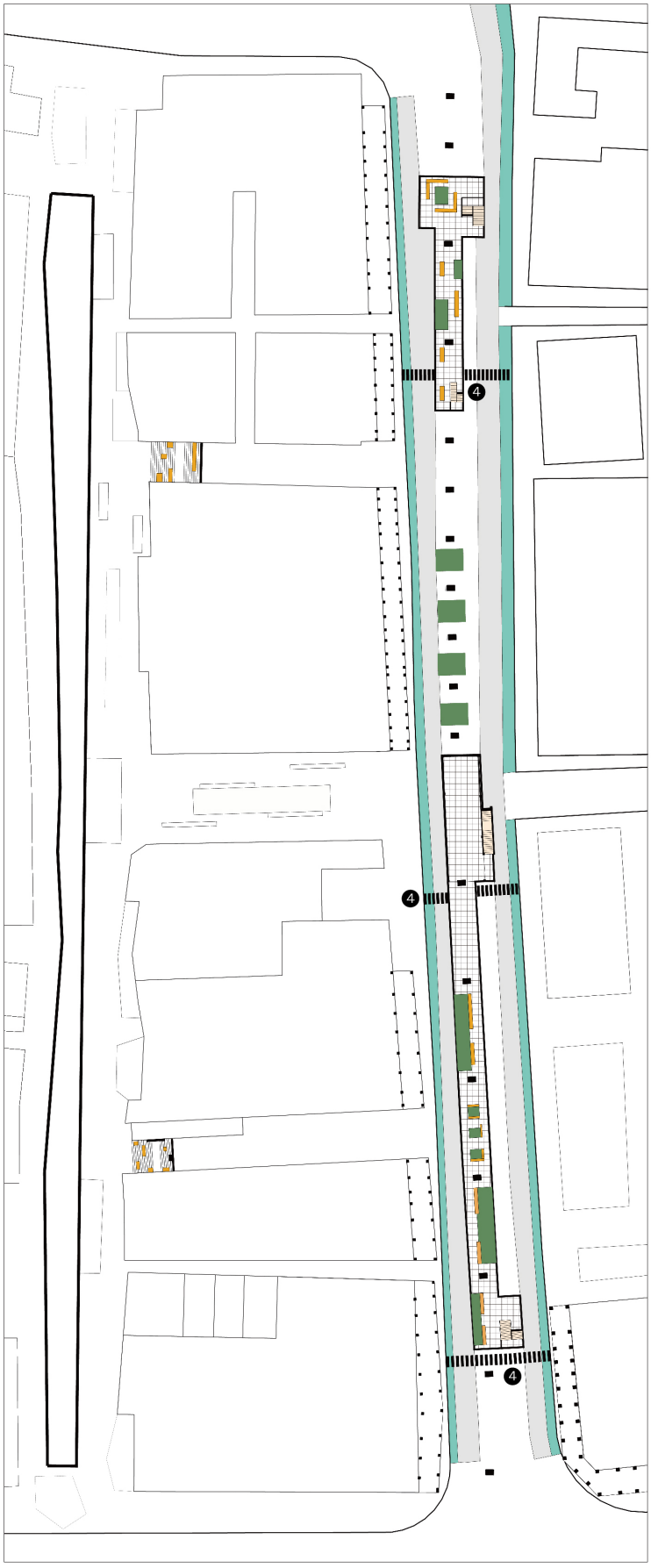


Site Plan

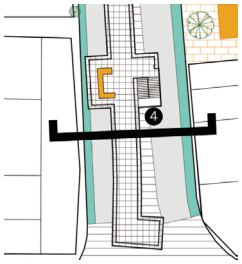


Ground Floor Plan

Design outcomes

PILOT EXPLORATION ON STREET SCA

Site 1: Residential leisure



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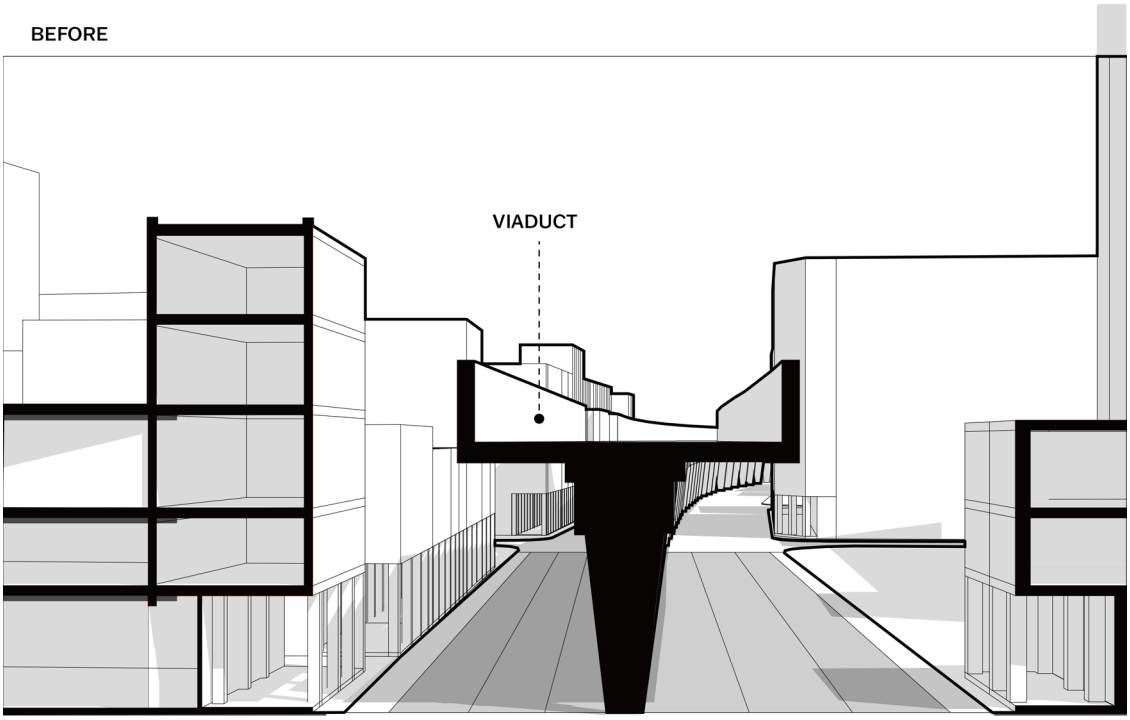

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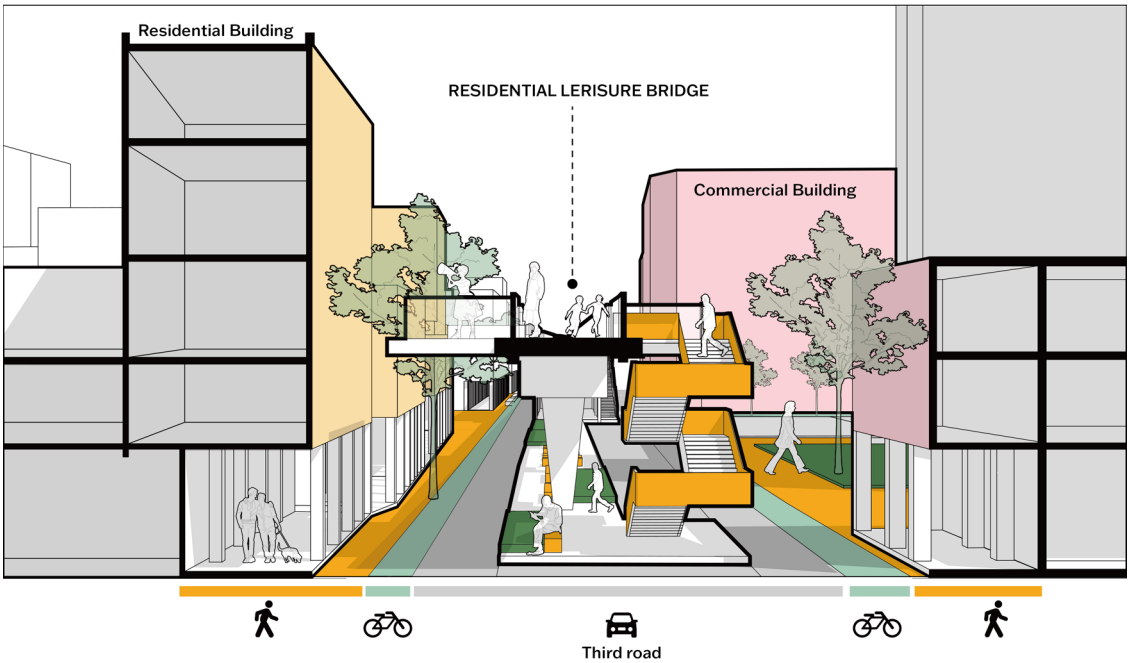


ALE

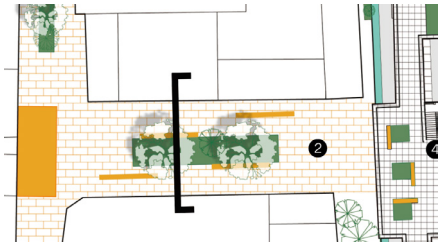
status quo

ideal

Design outcomes

PILOT EXPLORATION ON STREET SCA

Site 1: Residential leisure



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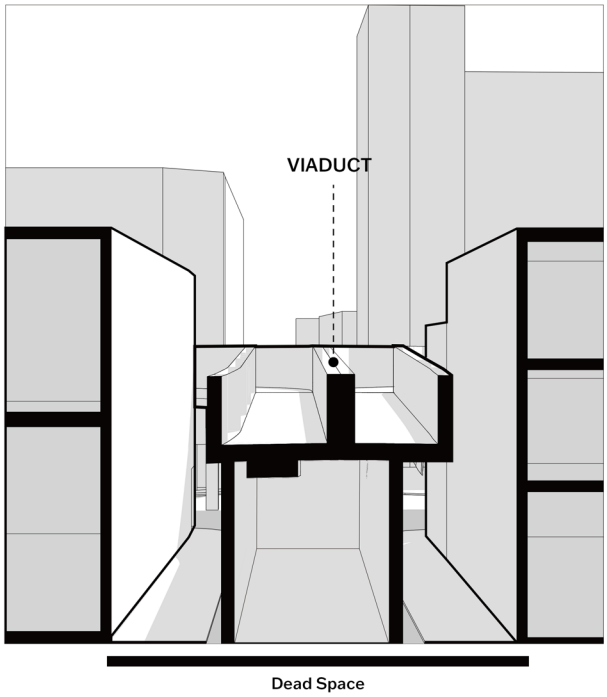

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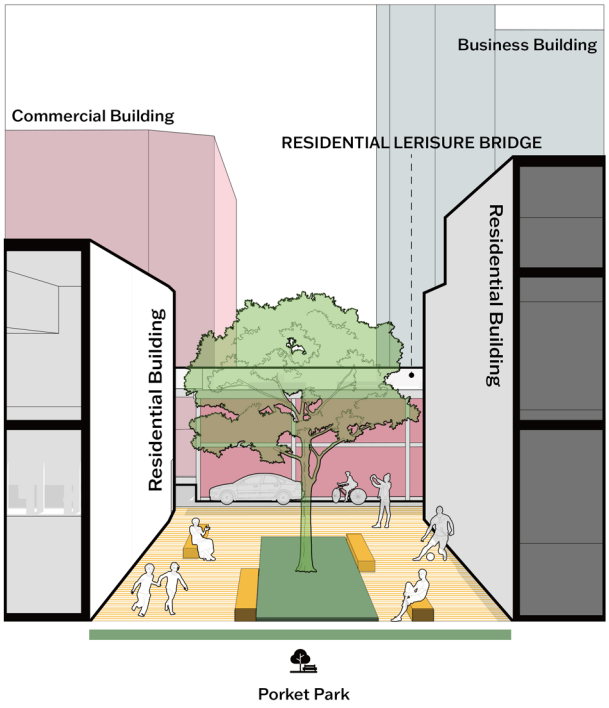


ALE

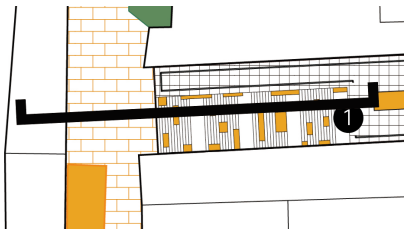
status quo

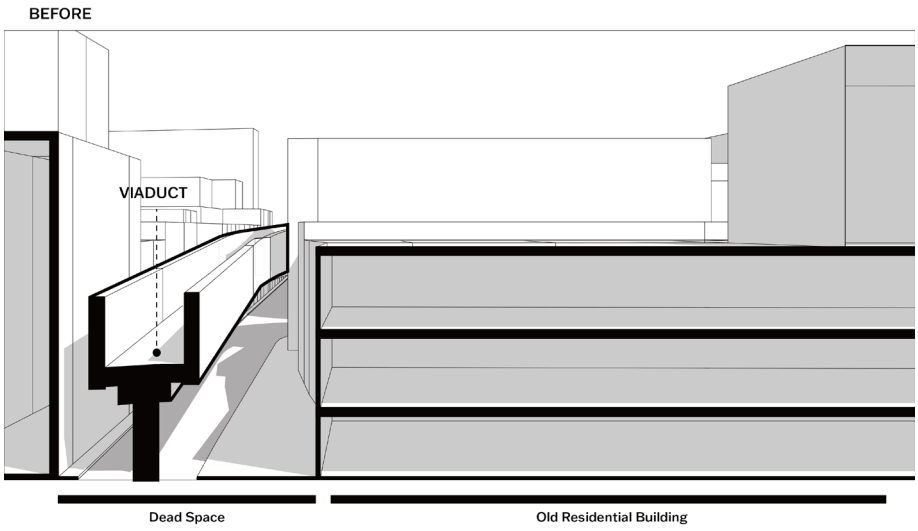
ideal

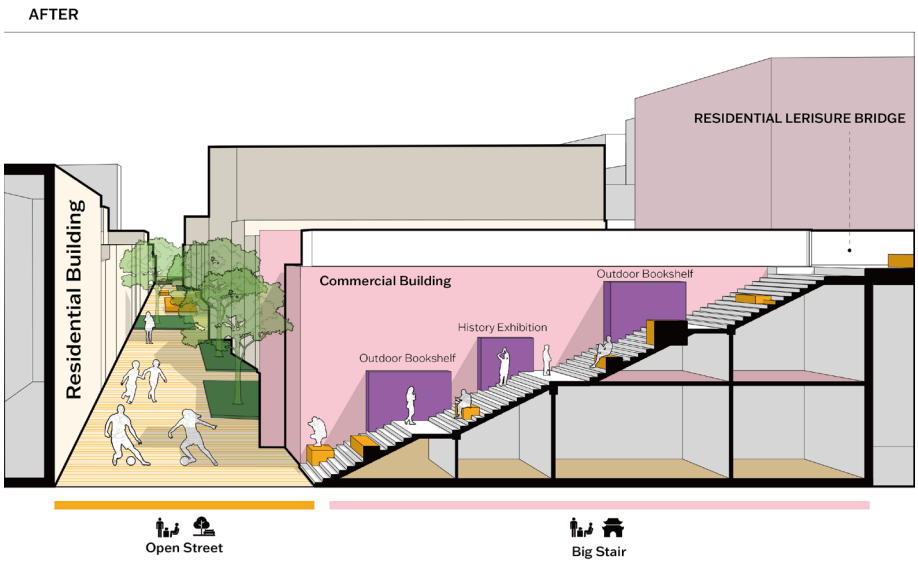
Design outcomes

PILOT EXPLORATION ON STREET SCA

Site 1: Residential leisure







ALE

status quo

ideal

Design outcomes

PI

Sit

Statu

Site Plan

N

0 10 20 50(m)

- Greenery
- Public space
- Street funiture
- Bicycle lane
- Car lane
- Walking bridge

1. Big stairs
2. Residents Square
3. Commercial Street
4. Exit&Entrance
5. Commercial shop
6. Rooftop garden

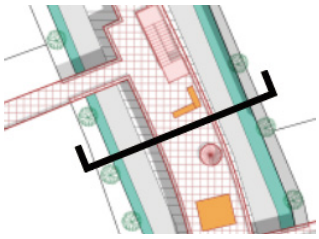
This area holds significant commercial potential. The proposed transformation focuses on economic integration, necessitating structural modifications to the viaduct to allow more sunlight and open space for shops on both sides. Extending parts of the bridge will enhance connectivity between different retail outlets, and the space above and below the bridge will be repurposed to accommodate additional retail shops. This redesign aims to maximize commercial activity and create a vibrant shopping environment.

Ground Floor Plan

Design outcomes

PILOT EXPLORATION ON STREET SCA

Site 2: Retailed commerce



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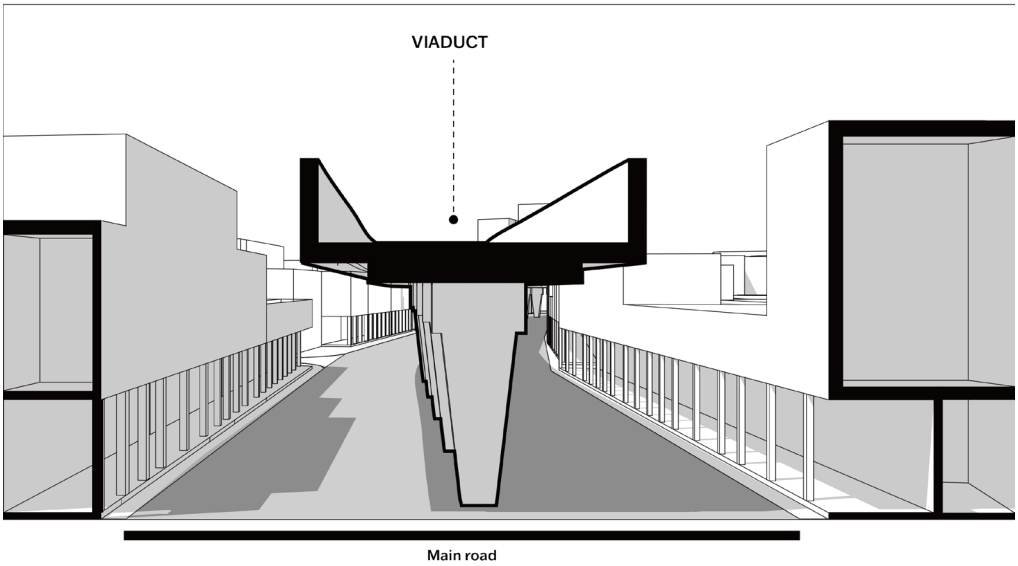

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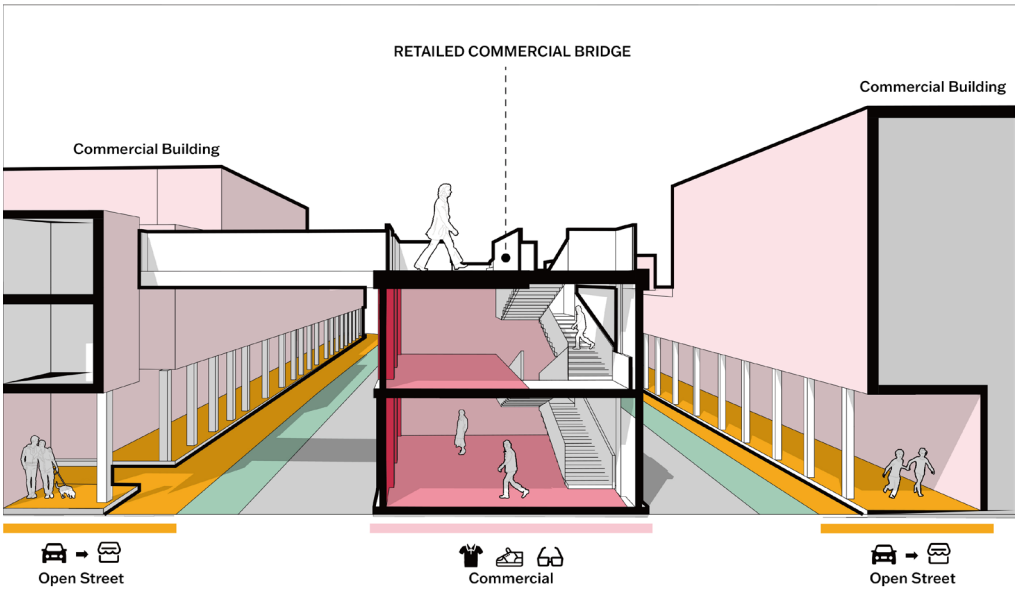


ALE

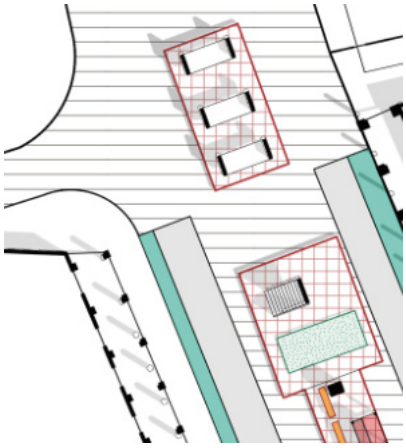
status quo

ideal

Design outcomes

PILOT EXPLORATION ON STREET SCA

Site 2: Retailed commerce



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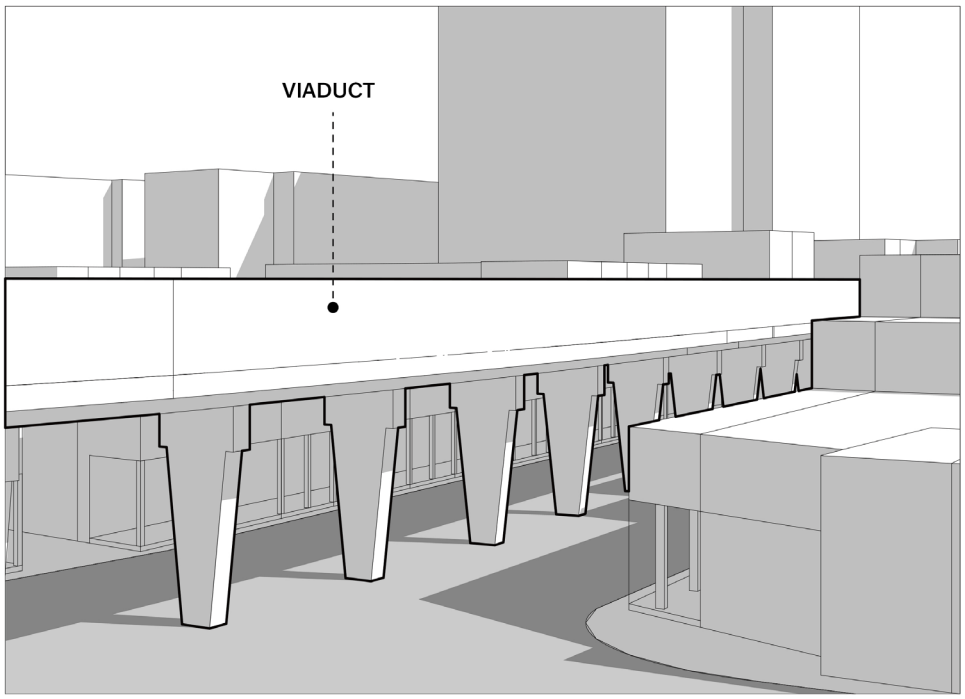

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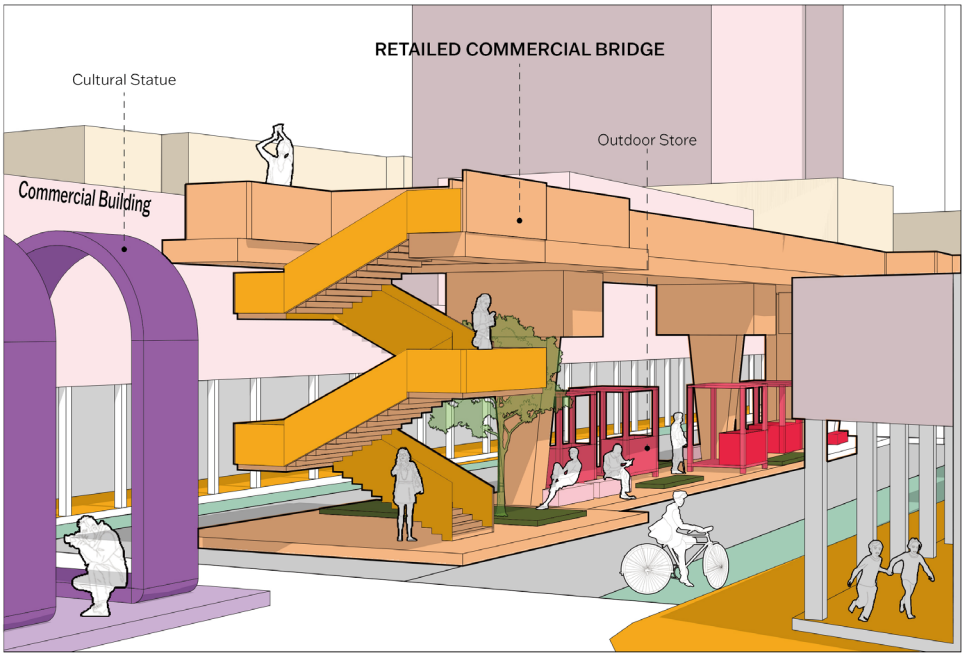


ALE

status quo

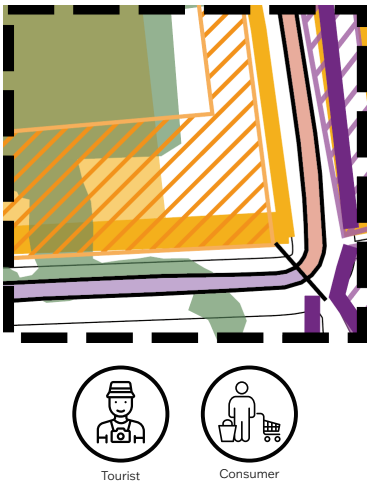
ideal

Design outcomes

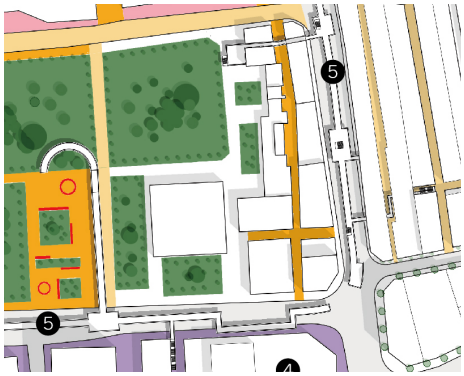
PILOT EXPLORATION ON STREET SCA

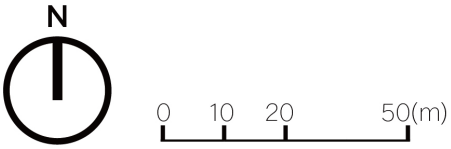
Site 3: Public Tourism

Status quo



Master plan





- Greenery
- Public space
- Street funiture
- Bicycle lane
- Car lane
- Walking bridge
- 1 Urban park
- 2 Residential Living Street
- 3 Commercial Street
- 4 Exit&Entrance
- 5 Commercial shop
- 6 Rooftop garden

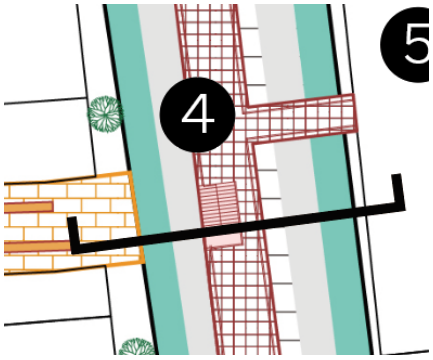
ALE

Site Plan

Design outcomes

PILOT EXPLORATION ON STREET SCA

Site 3: Public Tourism



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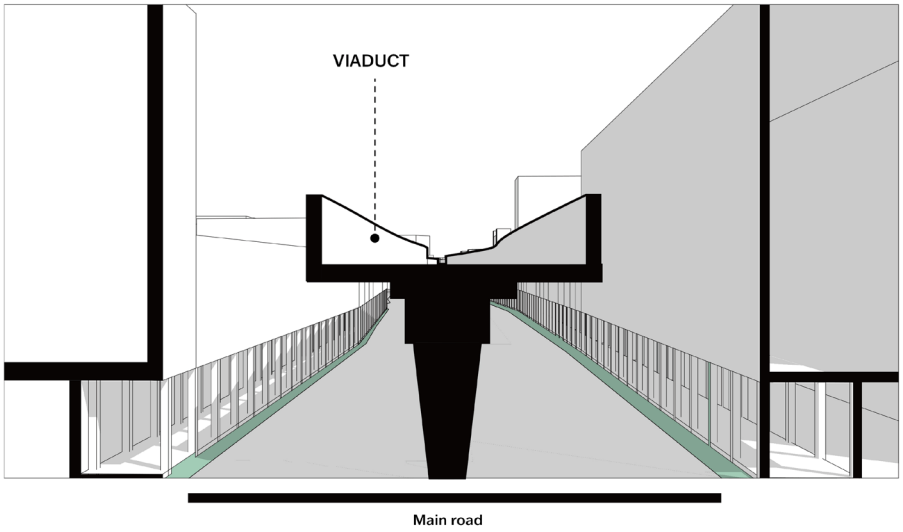

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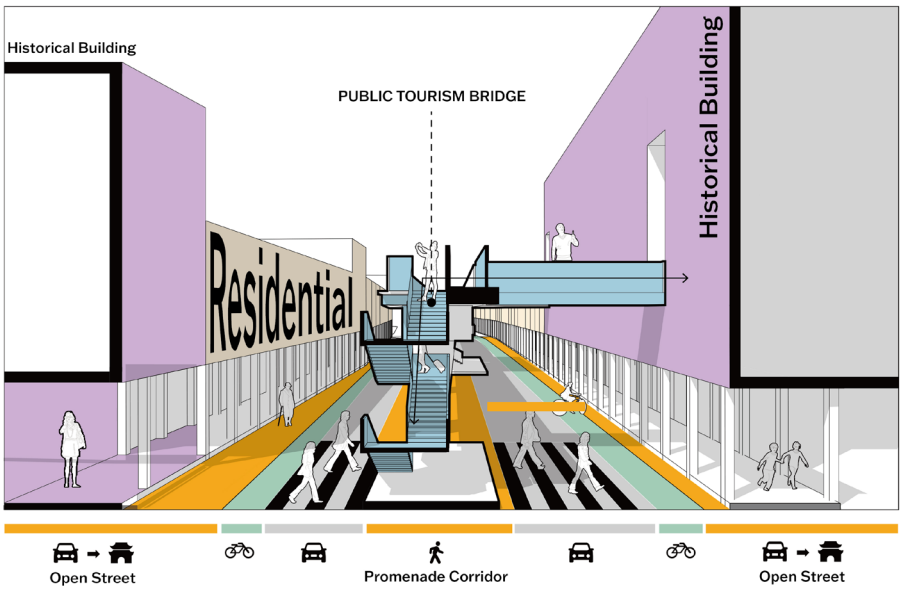


ALE

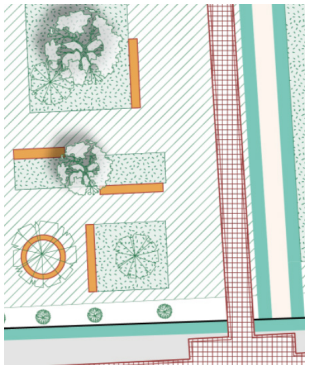
status quo

ideal

Design outcomes

PILOT EXPLORATION ON STREET SCA

Site 3: Public Tourism



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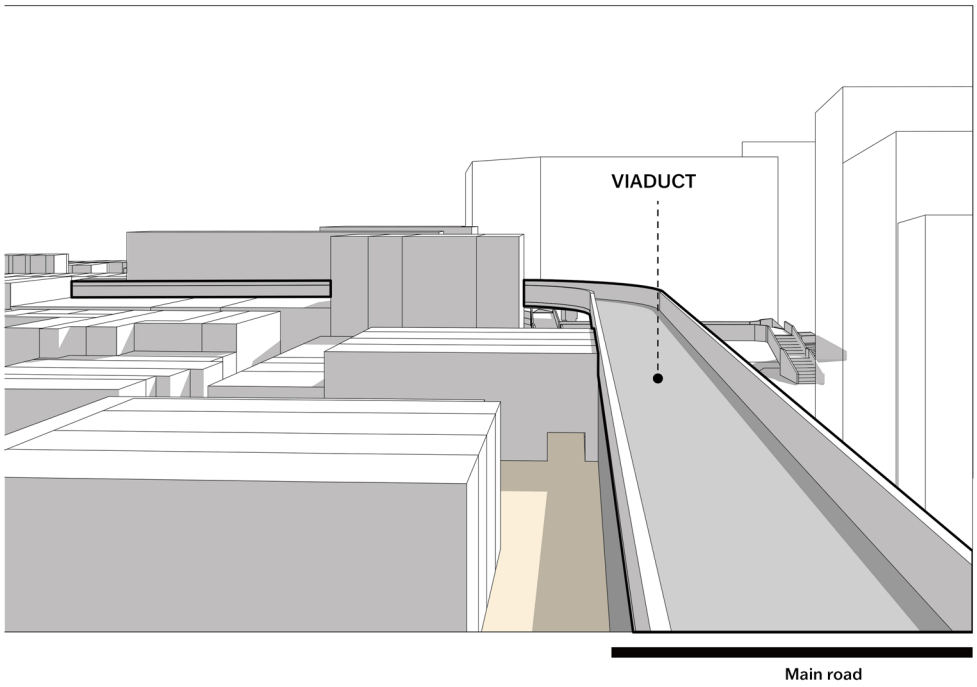

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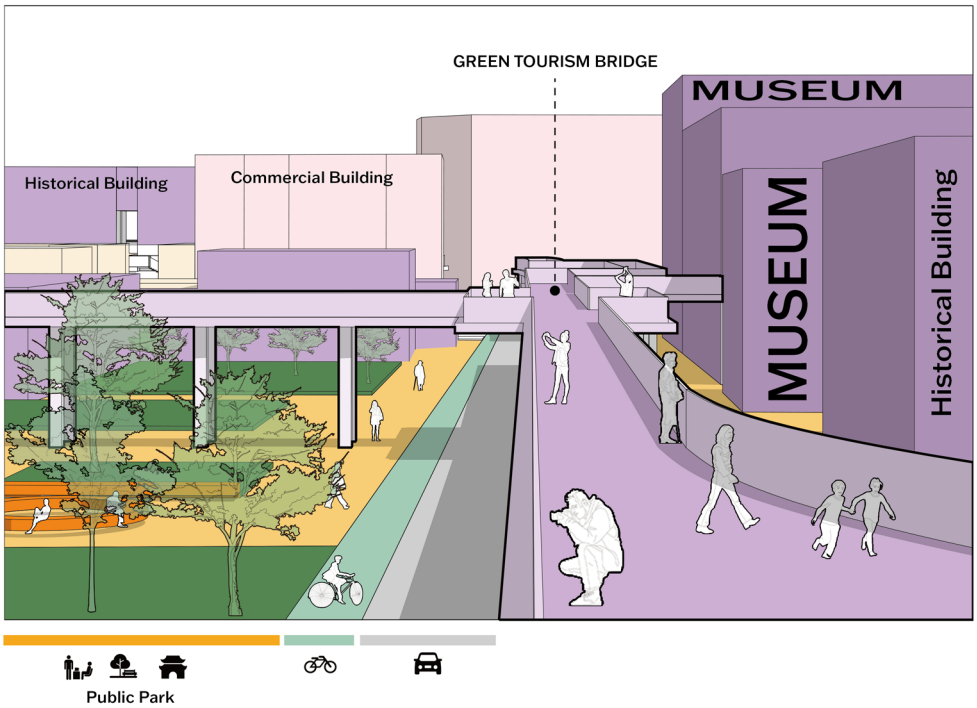


ALE

status quo

ideal

8

REFLECTION& DISCUSSION

Reflection&conclusion

RELEVANCE OF THE PROJECT

Social relevance

While addressing the common issues prevalent in most Chinese cities, this project also considers the urgency of Guangzhou's unique challenges as a typical city with specific problems. During China's rapid infrastructure development, the quality of urban life was often neglected due to the technological conditions and development concepts at that time. In future urban redevelopment processes, these areas will need to be renovated or redeveloped to meet higher livability standards.

The renovation project of the Renmin Road Viaduct in Guangzhou holds significant social value. It not only focuses on enhancing traffic efficiency but, more importantly, on improving the quality of life for local residents. Through the re-planning and redevelopment of the viaduct and its surrounding areas, this project aims to restore and enhance the vibrancy of the neighborhood, improve the quality of public spaces, promote commercial prosperity, and protect and promote historical and cultural heritage. The outcomes of this project are expected to facilitate changes in urban neighborhoods on multiple scales, bringing street life back to the community and creating a more vibrant and livable urban environment. This will have a positive impact on society as a whole, providing a successful model for balancing traffic needs with quality of life. It is hoped that this project will offer valuable insights and references for other cities facing similar challenges.

Scientific relevance

The powerful integration of elevated transportation infrastructure into urban spaces, with its spatial, permanent, and fixed characteristics, makes it an unavoidable part of the urban environment, influencing and transforming human living conditions. Roads should not be seen merely as functional spaces for urban traffic but also as important urban public spaces. This paper attempts to establish a new perspective on urban elevated transportation spaces, focusing on the issues that the "negative spaces" of these elevated structures bring to urban morphology and vitality. It objectively analyzes and evaluates the potential for utilization and the limiting factors of such special spaces. Based on a detailed and comprehensive analysis of the current state of utilization and reuse, and combined with successful reuse examples from both domestic and international contexts, the paper proposes specific strategies for the reuse of these spaces.

Ethical considerations

This project is centered on the perspective of urban residents, aiming to meet the demands of urban transportation while improving environmental quality. It aligns with government policies focused on improving street conditions and demolishing viaducts, but it also challenges the immediate economic interests of investors and real estate developers. However, the project's implementation will consider commercial economy and cultural tourism development as part of long-term benefits. It will demonstrate that the livable spaces desired by residents and the commercial value sought by investors can coexist harmoniously within this community.

LIMITATIONS OF THE CHOSEN METHODOLOGY

In my project, I used a number of site analysis methods, literature research methods, and design methods in the research and design aspects respectively. In the process of site analysis, my way of working is more of an observation and interpretation of the site as an urban designer, coupled with various site data. I think what is more lacking in this process is the communication with the people in the site, to understand more deeply the ideas of the people living here, after all, the design has a target group. Therefore, I conducted a field work after the theoretical research stage of P2, trying to understand the needs of the crowd through questionnaire distribution and random interviews. However, the shortcoming is that due to the difference in dialect and the limitation of student status, I was able to get less effective suggestions. Due to the complexity of urban design and the large number of stakeholders involved, urban design is often more suitable for teamwork and multiple people to obtain information and organize it, and my ability alone is still limited. In addition, in terms of literature research, I could have studied the localization of the design methodology, and thought about how the European design methodology could be more perfectly practiced in a site like Guangzhou, but I didn't discuss it more due to the limitation of time. Overall my work is more of an experimental research with some reference value.

Reflection&conclusion

TRANSFERABILITY OF PROJECT RESULTS

Whether modern cities must rely solely on elevated structures to meet transportation needs is a controversial question. Many cities and regions with the necessary conditions are already exploring alternative solutions to traffic problems to restore urban fabric.

In a sense, the notion that viaducts are transitional products has been validated by the practices of pioneering developed cities. Historically, the construction of viaducts began in earnest with Japan building numerous viaducts for the 1964 Olympics, setting a precedent for cities worldwide. Following Japan, the United States and Europe also embarked on extensive viaduct construction. In China, Guangzhou led the way in the 1980s, and the 1990s saw a nationwide surge in viaduct construction. However, during this period, cities like Boston and Chicago in the United States began demolishing urban viaducts, shifting towards underground transportation solutions. Other economically developed countries have taken similar actions. Notable examples include Boston's "The Big Dig," the Cheonggyecheon restoration in South Korea, and the ongoing demolition of the Yan'an Road viaduct in Shanghai, China.

My project is highly localized, addressing issues that are particularly characteristic of Guangzhou, such as the abundance of cultural and historical buildings, viaducts emblematic of rapid urbanization, and unique urban villages. Consequently, my project might serve as a more relevant reference specifically for Guangzhou or other regions within Guangdong. Nevertheless, the balance between mobility and livability has emerged as a pressing global issue in recent years, resonating across both Europe and Asia.

My project places a strong emphasis on improving functionality and the inherent quality of the space. As a result, many of the design strategies are relatively fundamental and adaptable. Given the complexity of this specific site, my design strategies encompass four major areas: cultural, economic, greening, and public space. This broad coverage enhances the project's overall relevance and applicability. These four components of urban space are crucial in any city. Therefore, the theoretical insights and practical applications developed through my project could contribute meaningfully to broader discussions on urban design and planning. This relevance extends beyond local boundaries, offering potential applications and lessons for similar urban contexts worldwide.

PERSONAL MOTIVATION

Although I have previously outlined various reasons for undertaking this project—ranging from news, policies, and public opinions about the need for viaduct demolition—I still want to emphasize my personal motivation for this research as an urban designer.

During my two years studying urbanism at Delft, I gradually realized my passion for meso-to-micro-scale urban design and my interest in the relatively complex urban issues in Chinese cities. I excel at observing current situations and identifying the original urban design problems behind certain urban phenomena. Mid-to-small-scale urban design often best captures the interactions between people and the environment. It is on the streets where urban designers can directly perceive whether the spatial scale is pleasant, how people use the space, and whether changes in space can impact their lives. As an urban designer, my human-centered philosophy is always at the core of my design approach, and I believe that all design initiatives should consider the local residents.

In June 2023, when I returned to Guangzhou and walked under the Renmin Road Viaduct, I couldn't help but notice the bustling laborers moving goods, residents climbing over the viaduct barriers rather than waiting for the traffic lights, the small shops with no customers, and the residential buildings overshadowed by the viaduct, deprived of sunlight. These chaotic scenes starkly contrasted with the orderly, quiet, and comfortable streets near viaducts in the Netherlands, sparking my interest in researching the Renmin Road Viaduct. From an intuitive, small-scale perspective, studying the living conditions of residents under the viaduct and attempting to improve their lives through urban space reconstruction is highly meaningful to me.

Moreover, researching urban issues in China has always been my focus. Reflecting on the past hundred years of modern China's construction history, rapid development amidst social upheaval and large-scale urban construction has driven China's swift urbanization. Behind this rapid economic development, certain compromises and sacrifices are inevitable. As with the initial construction of the Renmin Road Viaduct, experts predicted it would eventually harm the urban environment, but the urgent task was to solve the traffic problem. Urban issues in China are often deeply intertwined, complex, and contradictory, whether between government policies and the overlooked needs of residents or between the construction of non-profitable public spaces and investors seeking higher returns.

Guangzhou is a prime example of a megacity that epitomizes the positive aspects of rapid economic development while retaining numerous livelihood issues. Researching urban issues in such a typical megacity allows me to gain a deeper understanding of China and my hometown. Academically, the complexity of Chinese urban problems also challenges my professional abilities. As someone born and raised here, observing the city's development and wanting to participate is a natural inclination. As an urban designer, I prefer to see myself not just as a creator but as a mediator of existing urban conflicts, responding to the compromises and sacrifices made by urban designers over the past decades and continuously improving urban development.

9

BIBILIOGRAPHY& APPENDIX

QUESTIONNAIRE AND INTERVIEW

Renmin Road Viaduct Renovation Survey

Hello! I am a university student studying urban planning, currently conducting a study on the renovation of the Renmin Road Viaduct. I need to understand your current living experience as a local resident and your constructive opinions on the renovation of the Renmin Road Viaduct, which will help in the future reconstruction of the viaduct. This survey is anonymous, and we assure that your information will be kept confidential and used solely for research purposes. Thank you for your cooperation and support.

1. What is your gender? [Single choice] *
- ○ Male
- ○ Female

2. What is your age? [Single choice] *
- ○ 0—17
- ○ 18—25
- ○ 26—40
- ○ 41—60
- ○ Over 60

3. What is your occupation? [Single choice] *
- ○ Employee
- ○ Student
- ○ Retired
- ○ Self-employed
- ○ Other _____

4. What modes of transportation do you usually use to reach this section of the road? [Multiple choice] *
- □ Walking
- □ Biking
- □ Bus
- □ Private car

5. Are you satisfied with the current road planning on either side of the viaduct? [Multiple choice] *
- □ Dissatisfied, incomplete non-motorized lanes
- □ Dissatisfied, chaotic traffic
- □ Dissatisfied, disorder among cyclists and pedestrians, jaywalking
- □ Satisfied

6. How would you rate the enviro
choice] *
- ○ Very poor
- ○ Poor
- ○ Average
- ○ Good

7. What is your usual purpose for
[Multiple choice] *
- □ Traffic passage
- □ Commercial activities
- □ Leisure
- □ Other _____

8. Do you find it convenient to ac
side of the viaduct? [Multiple choi
- □ Inconvenient, circuitous walkin
- □ Inconvenient, separated by veh
- □ Inconvenient, not enough cross
- □ Convenient

9. Do you think there are safety ha
[Multiple choice] *
- □ Yes, too much traffic
- □ Yes, there are some hidden cor
- □ Yes, aging infrastructure, insuff
- □ No

10. Why do you think the area n
activities, or why would you not wa
choice] *
- □ Poor lighting, dim
- □ Noise disturbance, noisy enviro
- □ Accumulation of trash, unsanit
- □ Overgrown with weeds, desola
- □ High traffic volume, low safety
- □ Inappropriate scale, not suitabl
- □ Lack of design, insufficient facil
- □ Other _____

11. Do you think the viaduct cause
how much does it disturb your life
- ○ Very disturbing

onment under the viaduct? [Single

visiting the area near the viaduct?

ccess shops, parks, etc., on either
ce] *
g routes
nicle lanes
swalks

zards associated with the viaduct?

rners under the bridge
ficient lighting

near the viaduct is unsuitable for
ant to stay there for long? [Multiple

onment
ary
te

le for activities
lities

es noise and exhaust pollution, and
? [Single choice] *

o Somewhat disturbing
o Moderately disturbing
o Slightly disturbing
o Not disturbing

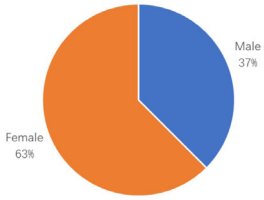
12. How would you describe the cultural and historical atmosphere of the arcade community on either side of the viaduct, and would you stay, play, or take photos here? [Single choice] *
o Great atmosphere, suitable for leisure
o Average atmosphere, not a frequent visitor
o Poor atmosphere, never come here for leisure

13. If the viaduct were to be renovated, how would you like it to be transformed or what features would you like it to have? [Multiple choice] *
□ Demolish it
□ A pedestrian bridge with scenic views
□ Dedicated bridge for buses
□ Commercial retail space under the bridge
□ Leisure and fitness garden space
□ Open space
□ Restrooms
□ Garbage facility
□ Parking lot
□ Other _____

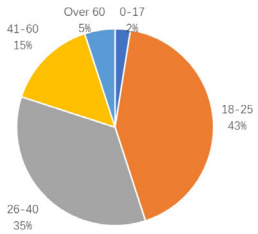
14. If you have any other valuable comments not mentioned, please add:

_____

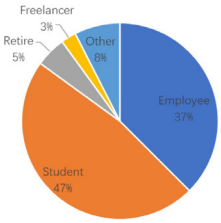
Gender



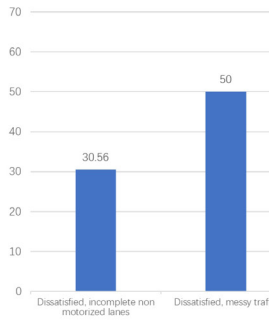
Age



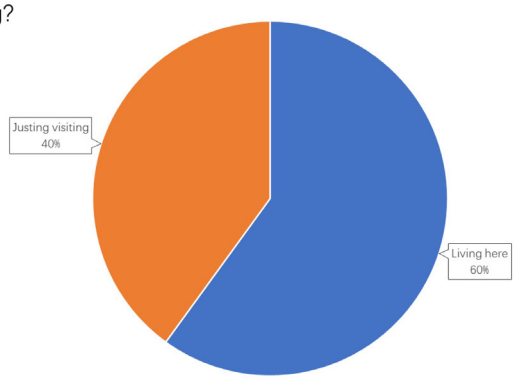
Occupation



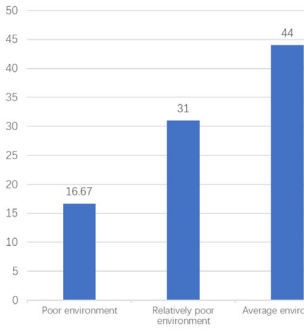
Are you satisfied with the current roa



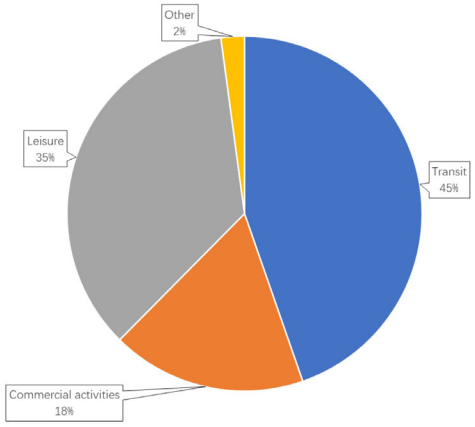
Do you live in a neighborhood near the viaduct or are you just visiting?



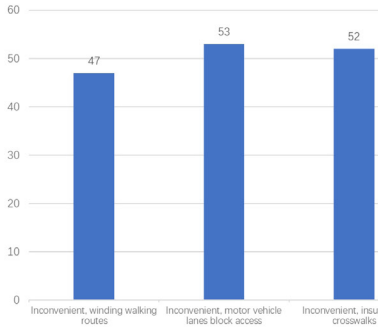
Perception of the space under and o



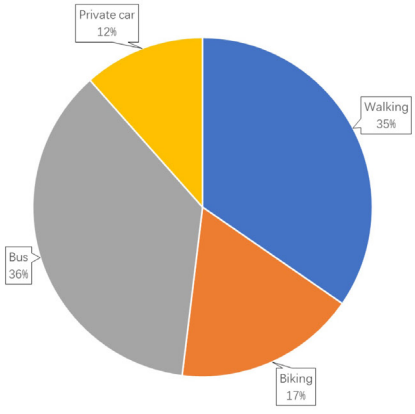
What do you usually do near this viaduct?



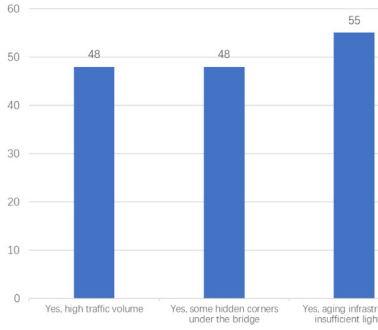
Do you think it's convenient to reach etc. on either side of the viaduct?



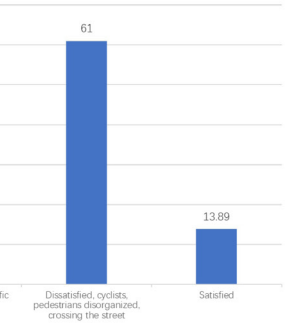
How do you usually travel to this road segment?



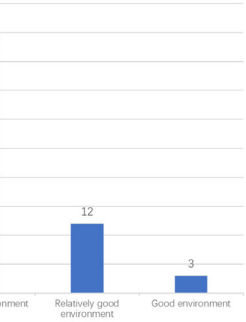
Do you think there are safety hazards



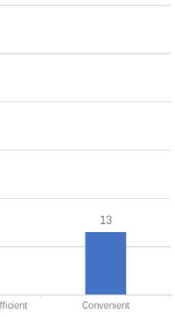
d planning on both sides of the viaduct?



n either side of the viaduct

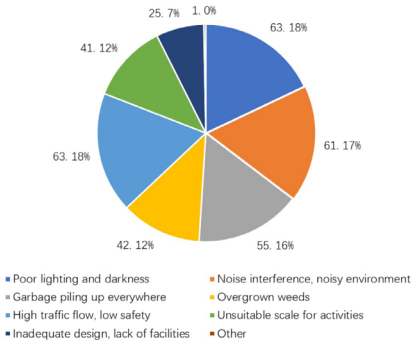


the stores, parks,

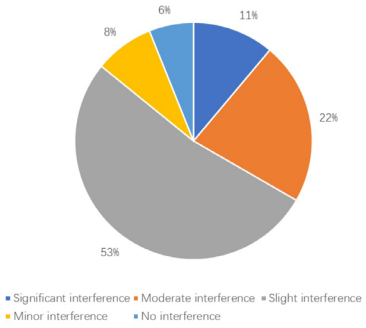


s on this viaduct?

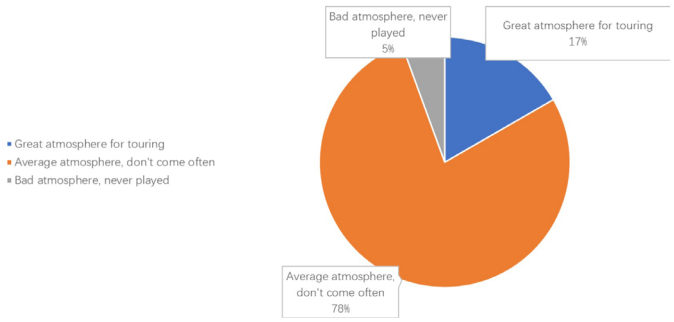
What other shortcomings do you see here that discourage you from traveling or staying longer?



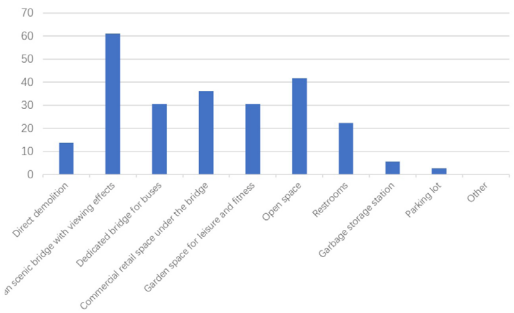
Do you think the viaduct is currently causing noise and exhaust pollution, and to what extent does it interfere with your life?



What do you think of the current cultural and historical atmosphere of the neighborhoods on both sides of the viaduct, and would you like to stay, travel, or take photos here?



How would you like the viaduct to be changed or what function would you like it to have if it is renovated?



Conclusion of the questionnaire

According to the survey data, the respondents are mainly young adults aged 18 to 40. Walking, biking, and taking public transit are their primary modes of travel, and most would not choose to drive here. Their main purpose for arriving at the roadway is traffic through the area, with fewer choosing to shop or play. Most people are less satisfied with the road plan on both sides of the viaduct, and are particularly dissatisfied with the incomplete non-motorized lanes and messy traffic flow.

Regarding the safety of the viaducts, a high percentage thought there were hidden dangers, mainly in the form of excessive traffic flow and hidden corners under the bridge. However, in terms of the environment, the majority of people think that pollution caused by cars is small, and the main problem is still the noisy living environment. The reasons for not wanting to stay near the viaducts mainly include poor lighting, noise disturbance, and accumulation of garbage. The willingness to renovate the viaducts was mainly reflected in the desire for pedestrian landscape bridges with ornamental effects and under-bridge space for commercial retail. Overall, the survey shows that respondents have some dissatisfaction with the viaduct and its surroundings, and expect future renovation to enhance its environmental quality and attractiveness.

Portrait of the residents

Residents of the street have a lower level of education, predominantly high school and below, supplemented by post-secondary education. This leads them to engage in occupations mainly concentrated in the field of low-skilled labor. their awareness of the protection and renewal of the street space is relatively weak.

The residents are mainly clerical and technical workers, and their employment direction is closely related to their education level. Due to their low level of education, they are mainly engaged in low-skilled work. This is consistent with the industry pattern of the area, which forms a street dominated by the wholesale and retail sector.

In terms of income, according to the Guangzhou Municipal Bureau of Statistics (GBS), the average salary in Guangzhou in 2020 was 135,138 yuan per year, i.e. about 11,261.5 yuan per month. In this street, residents' income is concentrated in the range of RMB 4,000 to RMB 10,000, accounting for 66.73% of the total population. This means that most people's incomes are below the citywide average. This shows that the quality of life of street dwellers is likely to be low, and they do not overemphasize high quality of life, focusing more on maintaining a basic standard of living. Therefore, in their consideration of spatial needs, they are more concerned with functionality, practicality and adaptability to the needs of the general public.

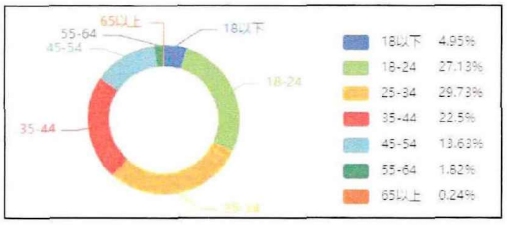


图 3. 17 活动主体年龄构成

（来源：https://www.data-dance.com）

Age composition from data

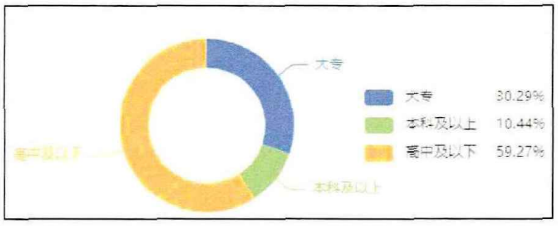


图 3. 18 活动主体教育水平

（来源：https://www.data-dance.com）

Education level from data

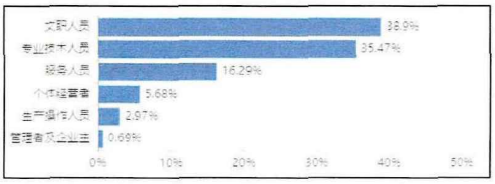


图 3. 19 活动主体职业

（来源：https://www.data-dance.com）

Occupation type from data

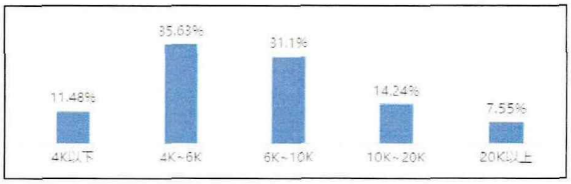


图 3. 20 活动主体收入

（来源：https://www.data-dance.com）

Income level from data

People demand

a lower level of education

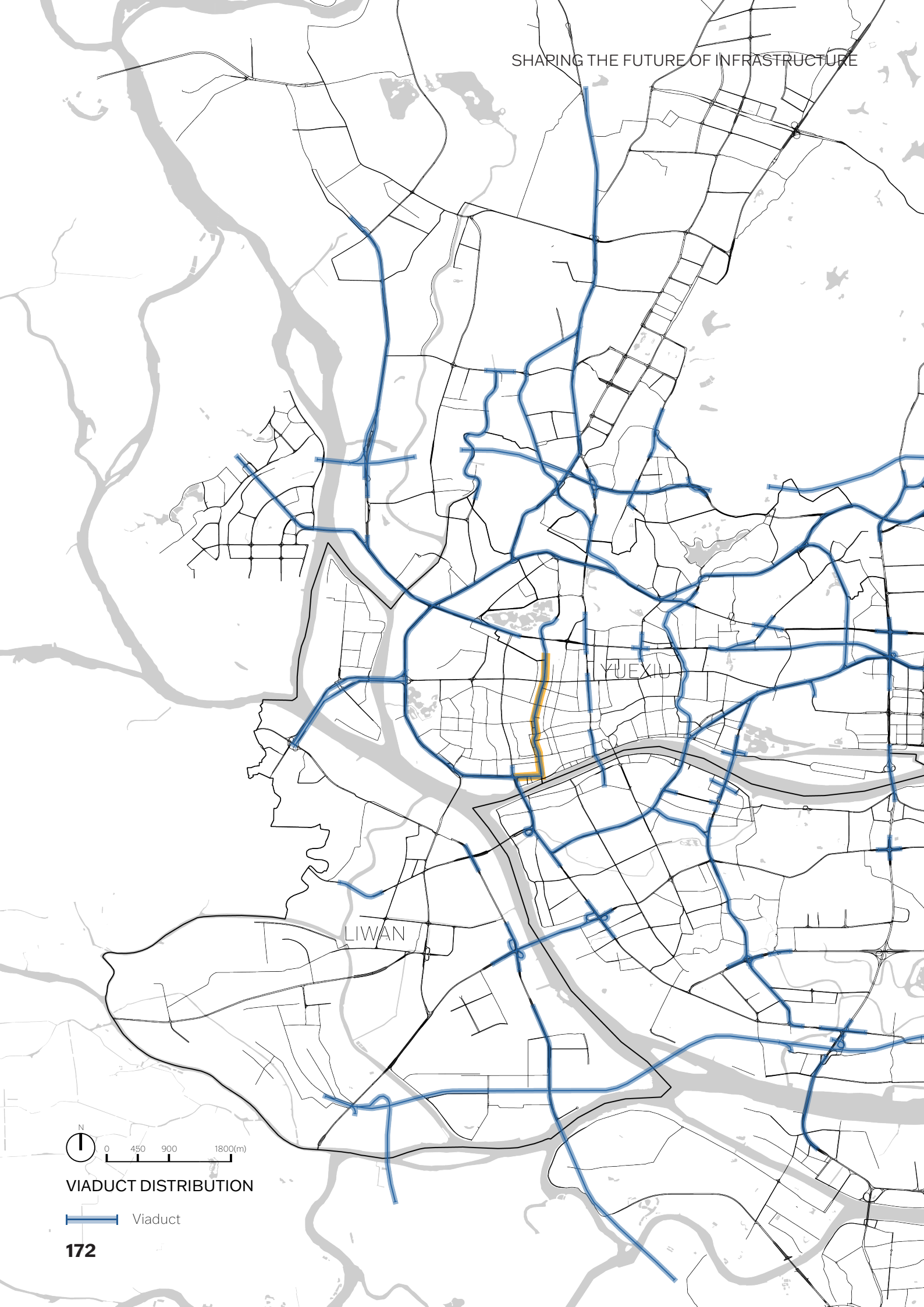
clerical and technical workers

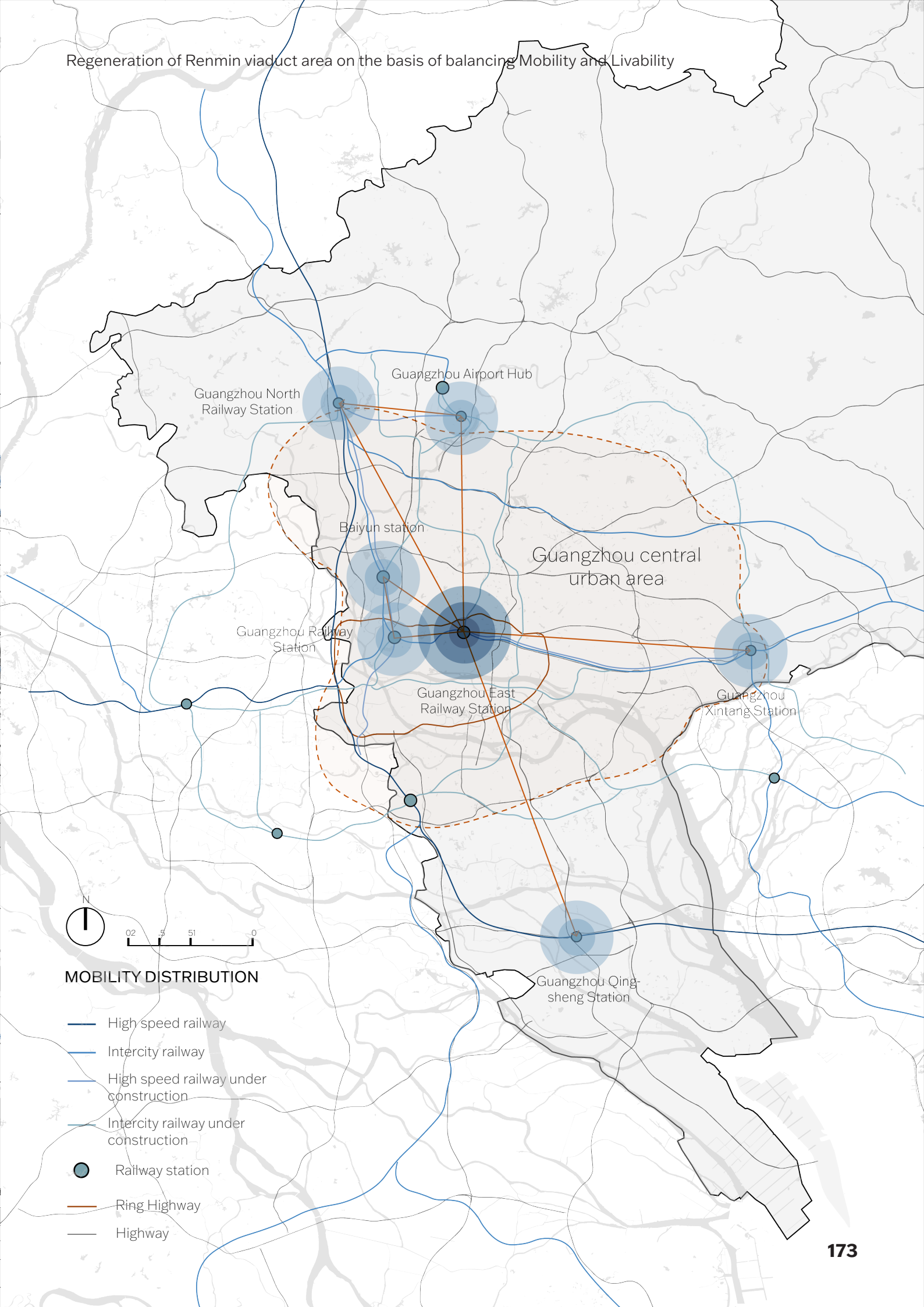
aging (population)

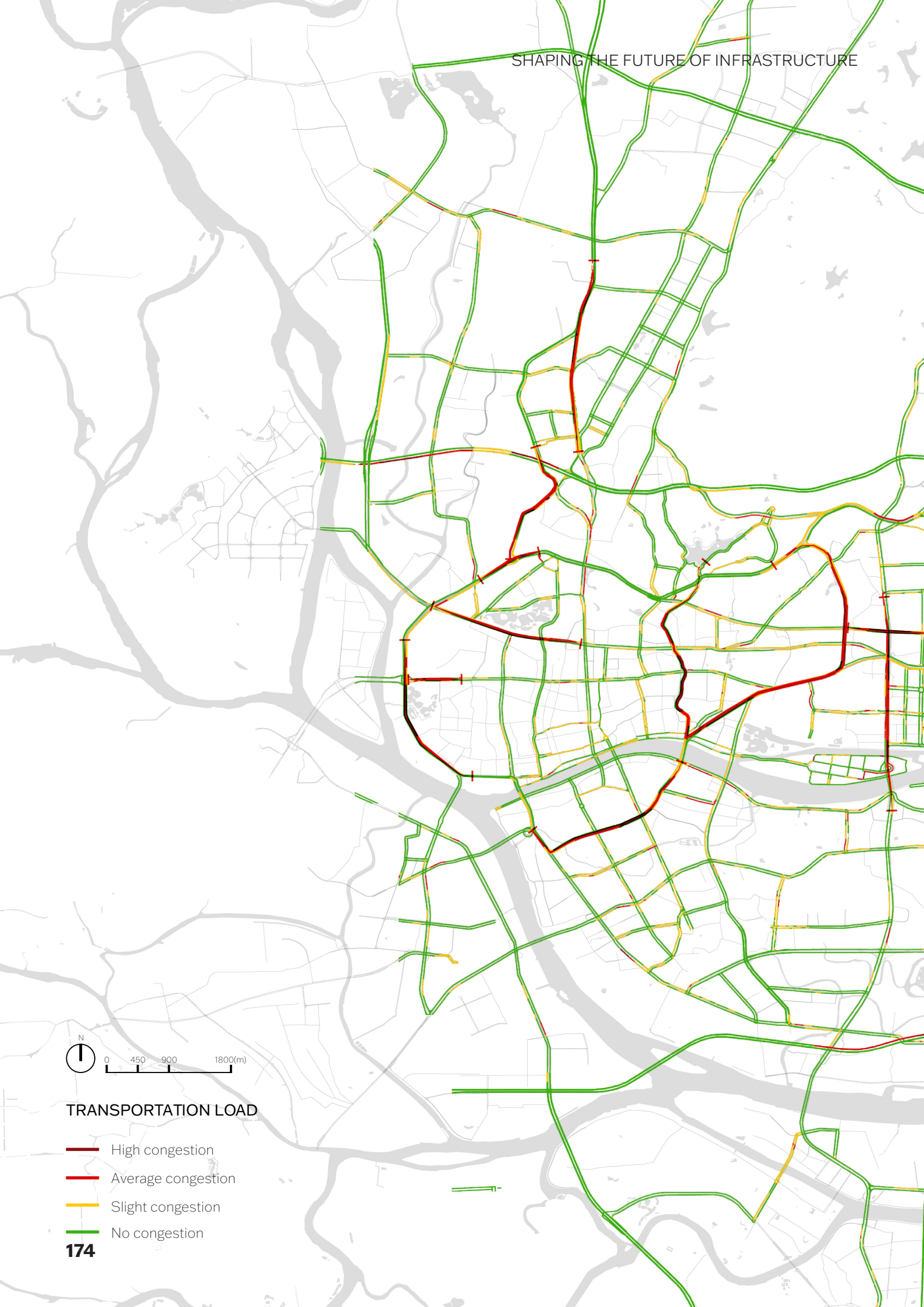
incomes below the citywide average

in their consideration of spatial needs, they are more concerned with functionality, practicality and adaptability to the needs of the general public

awareness of the protection and renewal of the street space is relatively weak


YUEXIU
LIWAN
N
0
450
900
1800(m)
VIADUCT DISTRIBUTION
Viaduct


Guangzhou North Railway Station
Guangzhou Airport Hub
Baiyun station
Guangzhou central urban area
Guangzhou Railway Station
Guangzhou East Railway Station
Guangzhou Xintang Station
Guangzhou Qing-sheng Station
N
02 .5 51 0
MOBILITY DISTRIBUTION
High speed railway
Intercity railway
High speed railway under construction
Intercity railway under construction
Railway station
Ring Highway
Highway


N
0
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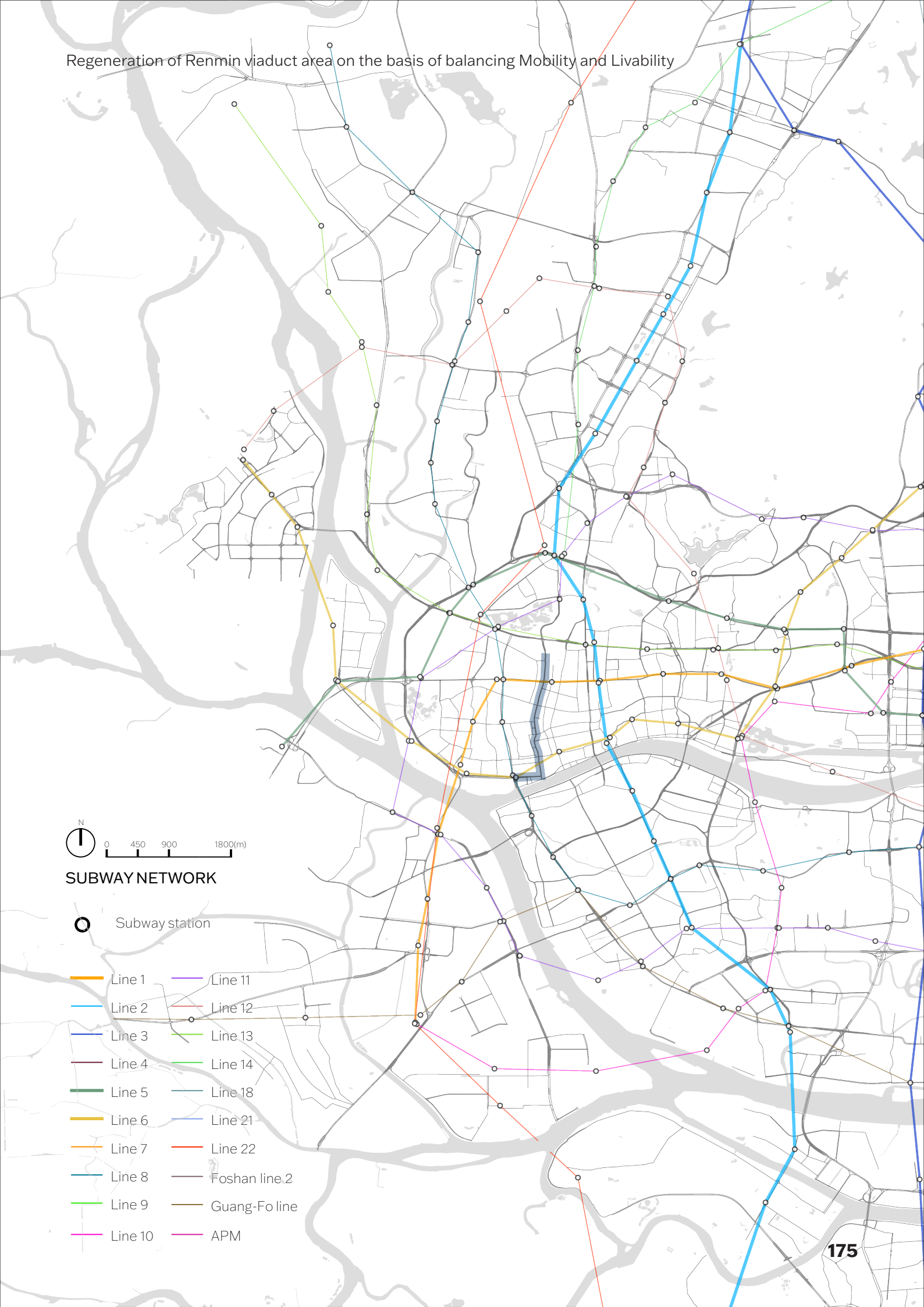
TRANSPORTATION LOAD
High congestion
Average congestion
Slight congestion
No congestion


N
0
450
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SUBWAY NETWORK
Subway station
Line 1
Line 2
Line 3
Line 4
Line 5
Line 6
Line 7
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Line 10
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Line 12
Line 13
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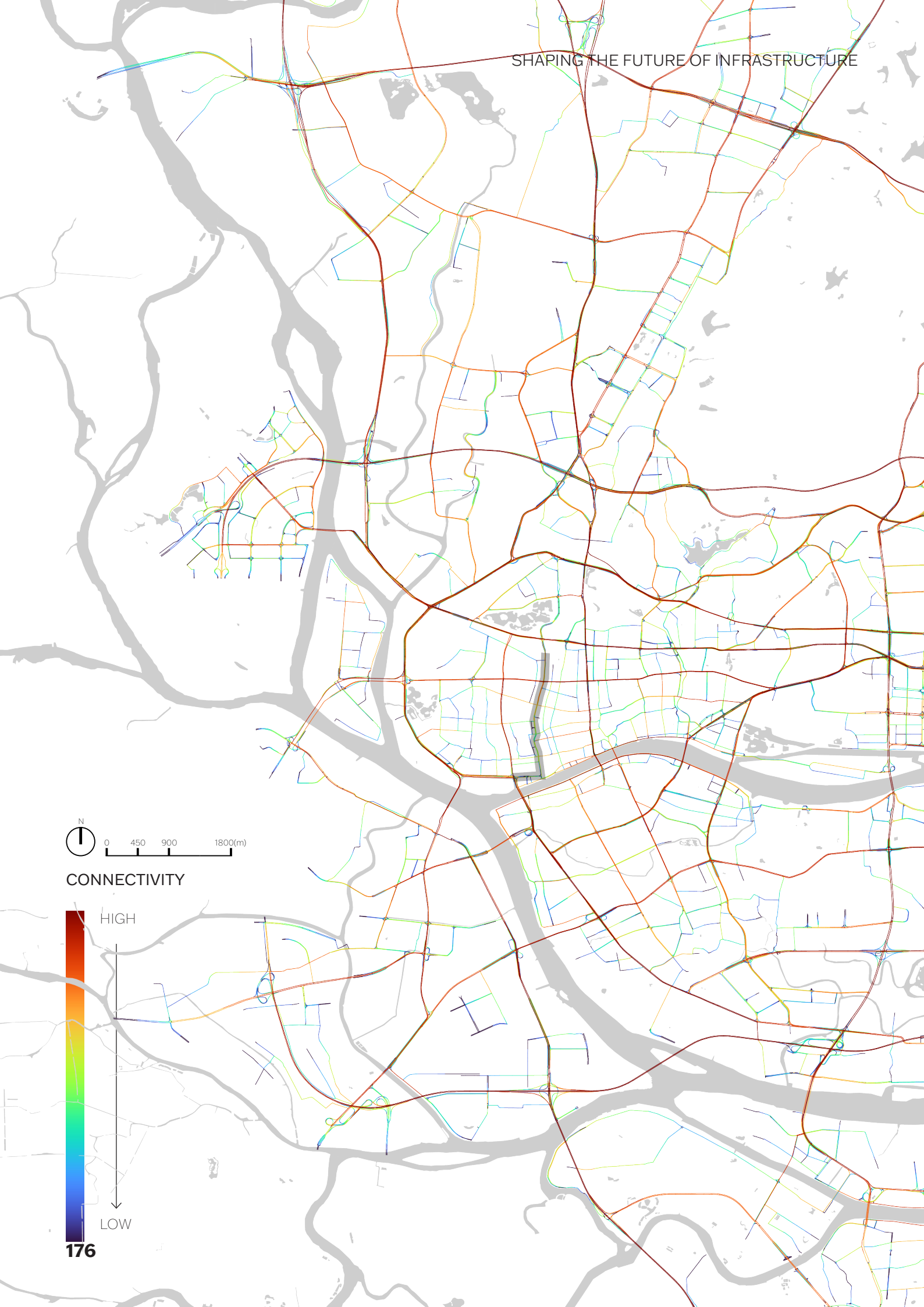
Line 18
Line 21
Line 22
Foshan line 2
Guang-Fo line
APM


N
0
450
900
1800(m)
CONNECTIVITY
HIGH
LOW

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