Global Environment Facility 6
CHINA SUSTAINABLE CITIES
INTEGRATED APPROACH PILOT PROJECT

## TECHNICAL SUMMARY SERIES

# NANCHANG
# SUMMARY REPORT

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# NANCHANG

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# NANCHANG

## SUMMARY REPORT

GEF-6 CHINA SUSTAINABLE CITIES INTEGRATED APPROACH PILOT PROJECT

1818 H Street NW
Washington, DC 20433
Telephone: 202-473-1000
Internet: www.worldbank.org

# Contents

# Illustrations

## Figures



## Tables

# Preface

The Sustainable Cities Integrated Approach Pilot was a worldwide program established by the multinational Global Environment Facility in its sixth funding round (GEF-6). As implemented in China, it was aimed at helping Chinese cities use the principles of transit-oriented development (TOD) to achieve sustainable land use policies and transit plans at the levels of city, transit corridor, and transit station. The five-year China project (GEF-6 China TOD) ran from December 2017 to March 2023. It was managed by the World Bank and implemented by China's Ministry of Housing and Urban-Rural Development (MoHURD) and seven representative large cities: Beijing, Tianjin, Shijiazhuang, Ningbo, Nanchang, Guiyang, and Shenzhen.

The Nanchang Development and Reform Commission managed the Nanchang GEF-6 Project Management Office. The planning and design of the Beijing project was undertaken by several consulting organizations.* This report is prepared by the team from Beijing Jiaotong University, it summarizes and evaluates the technical outputs of the project.

* The city-level study was undertaken by the Shenzhen Urban Transportation Planning and Design Research Center and the Nikken Sekkei Research Institute.
The corridor-level study was undertaken by Shanghai WSP Consulting and Shanghai Yisheng Management Consulting.
The station-level study was undertaken by the China Sustainable Transportation Center and the Beijing Urban Construction Design Group.


NANCHANG

# Abstract

Nanchang is at a pivotal moment for setting the pattern of its future growth through the application of transit-oriented development (TOD) principles. Currently, Nanchang enjoys rapid growth in the service sector, which provides a solid economic foundation for TOD. Although, the current state of TOD in Nanchang is good, there are still areas for improvement and enhancement. Public transportation has a low share of trips and has not established a significant competitive advantage over motor vehicles and electric bicycles. Also, the city's TOD involves multiple stakeholders but currently lacks a dedicated institutional mechanism for guiding it.

The Nanchang TOD project draws on advanced urban development concepts from both domestic and international sources to address the actual situation in Nanchang. It proposes planning and design frameworks, policy management frameworks, and implementation paths to strengthen TOD strategies at the urban, corridor, and station levels. At the city level, the project defines TOD zones and proposes strategies for each zone that will use the rail system as the core of a comprehensive transportation system. At the corridor level, the project focuses the strategies within the TOD influence range of the rail lines. At the station level, it considers an integrated model of urban transportation construction and land development management.

The project in Nanchang has produced the following results. First, it has assembled a complete set of quantitative evaluation indicators to support the improvement and implementation of TOD strategies. Second, it has shown how to augment both existing and future rail lines with conventional public transportation and pedestrian systems. Third, it has leveraged the potential for rail transportation to improve the layout of industry. Fourth, it has set out clear long-term goals for urban development while balancing the relationship between short-term and long-term considerations.


NANCHANG

# Part 1: TOD Strategy at the City Level

At the city level, the technical team has established a comprehensive transit-oriented development (TOD) framework for Nanchang that integrates factors such as spatial planning of land, land use patterns, and industrial layout, which influence strategic zoning. This framework system coordinates urban planning with transportation planning in three ways.

First, thirteen strategic TOD zones have been identified in the urban area, and development directions and levels have been proposed for each zone.

Second, the project provided guidance for optimizing the planning of the rail transit network, supporting Nanchang's urban spatial expansion, and achieving transportation development strategic goals.

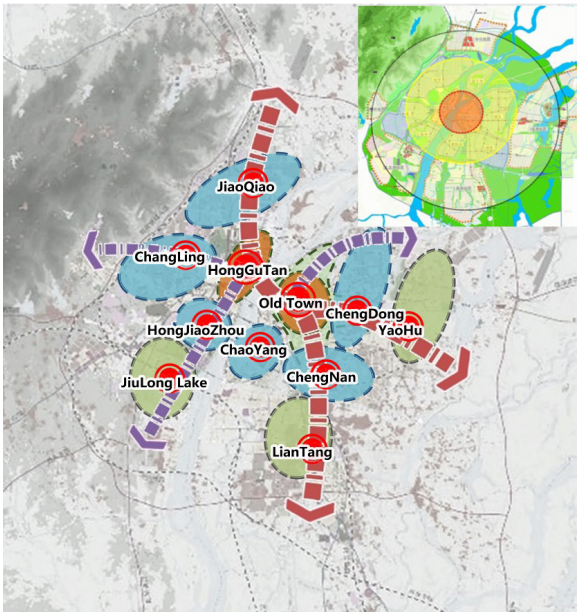
Third, the project proposed a comprehensive strategy for establishing a dominant position for public transit: establishing a multimodal and integrated public transportation system with rail transit as the core, plus bus services, medium-capacity transport, and seamless integration of modes, including walking and cycling. The scheme aims to promote green travel through a combination of public transportation and pedestrian-friendly approaches.

## 1. Overview of Urban Development in Nanchang

Nanchang City is the capital of the southeastern province of Jiangxi. Like most Chinese cities, it has experienced rapid urbanization and significant development of rail transit in the past decade. At the end of 2022, the total long-term population was 6.3 million. In 2022, its GDP of about CNY 665 billion yielded a per capita level of about CNY 111,031. The urban built-up area has expanded in the past decade from about 8 square kilometers to about 377 square kilometers (figure 1).

At the end of 2022, Nanchang's operating length of subway lines, at 128.3 kilometers, ranked 21st among 50 mainland cities. Nanchang is in a crucial stage of rail network development, offering a typical example of the promise of TOD. By establishing a city development model guided by public transportation, Nanchang aims to lower the climate impact of its development. This is a necessary measure for Nanchang to create a national demonstration zone for green and low-carbon development and an intrinsic requirement for achieving sustainable urban development under the constraint of limited spatial resources. Rail transit plays a crucial role in reducing car trips and the proportion of carbon emissions from transportation.

**Figure 1:** Nanchang in the Middle Yangtze River Urban Agglomeration and Its Spatial Structure




Source: Shenzhen Urban Transportation Planning and Design Research Center and Nikken Sekkei Research Institute, *Development and Implementation of Transit-Oriented Development (TOD) Strategies Guided by Public Transit at the Urban Level, and Project Management Support.*

## 2. Development Goals

In the context of TOD principles and Nanchang's development policies, the technical team has gathered suggestions for the city's future growth from stakeholder consultations and citizen surveys. These considerations led to the vision of an attractive, ecological capital that is green and low-carbon, intensive and diverse, vibrant and friendly.

**Green and Low-Carbon**

Integrate public transit with land development to create a pedestrian-friendly city that is in harmony with nature. The main strategies for developing a people-oriented, green, and sustainable urban ecosystem are as follows:

- Build a public transportation system primarily based on rail transit.
- Match rail transit development to both the urban center and the larger spatial structure through TOD, coupling transportation networks with centers of economic, residential, and social activity.
- Create neighborhoods and travel environments prioritizing pedestrian and public transit access.

**Intensive and Diverse**

- Promote intensive and diversified land development surrounding rail transit through TOD in the following ways:
- Increase the value of land development through spatial complexity, mixed use, and intensive aggregation.
- Improve accessibility for disadvantaged populations, ensure transit coverage of accessible facilities, and promote gender equality.

**Vibrant and Friendly**

Create people-centered "living circles"—pedestrian-friendly zones extending a 15-minute walk from a transit station—suitable for families, business, tourism, commerce, and aging. Creating such zones requires well-organized and convenient multimodal transportation nodes (by integrating subway, bus, and "slow"—pedestrian and cycling—networks) and good accessibility jobs. Through TOD, the aim is to enhance people's sense of happiness and belonging, increase the inclusivity of rail transit communities, and create a friendly residential environment for vulnerable groups.

## 3. Indicator System

Indicators quantify overall objectives and serve as a bridge between goals and strategies. The technical team has constructed a core indicator system to achieve the TOD development goals for Nanchang outlined above. The team in turn used the indicators as part of the evaluation system they developed for assessing the "macro–intermediate–micro" levels of TOD development in Nanchang (table 1). The evaluation system adopts a combination of qualitative and quantitative assessment methods.[1]

The macro level focuses on the alignment of spatial systems in TOD and low-carbon green development. At the intermediate level, the emphasis is on the interaction between rail lines and urban land and on the coordination of different transportation networks. At the micro level, the focus is on the detailed design of areas around the stations.

1 The team's evaluation system also drew on relevant guidelines, research, the concerns of the World Bank and MoHURD, and the characteristics of Nanchang's development.

**Table 1: Macro–Intermediate–Micro Evaluation System**

| Level | Evaluation Objectives | Evaluation Perspective | Evaluation Indicators |
|---|---|---|---|
| Macro | Dissecting the rail transit network and the land development patterns of regional spatial development, analyzing the overall impact of TOD on urban spatial development. | The rail transit system alignment with urban spatial characteristics and efficient accessibility. | Does the layout of the rail network adapt to the coupling of the urban center system?<br>Is the rail network efficiently accessible? |
| | | Land development's friendliness toward rail transit. | Has a rail-friendly urban form been developed?<br>Is there a reasonable structure of land and real estate market supply? |
| | | The transition toward low-carbon transportation. | Is the transportation structure transitioning toward low-carbon transportation? |
| Intermediate | Analyzing the integration of rail transit and bus services, as well as the diversification of housing and land use in the specific areas and corridors. The analysis examines how TOD can further enhance its role in transportation, housing, and other related aspects. | The formation of a diverse and vibrant urban fabric. | Does the land combination around hub stations support the cultivation of vibrant centers?<br>Can the land use around the rail network achieve social equity? |
| | | The seamless integration of multiple modes of transportation. | What is the level of integration and collaboration between conventional bus services and rail transit?" |
| | | The effective transmission of planning schemes. | Is the TOD concept effectively transmitted within the national spatial planning system? |
| Micro | Analyzing the well-being, comfort, safety, and health aspects of residents' employment and daily life around rail transit stations. Examines how TOD can contribute to a people-centered approach and address the implementation of details at the local level. | The alignment of the rail transit system with surrounding land uses and its effective integration. | Is there close integration between entrances/exits, pedestrian spaces, and land parcels? Is the connectivity of the station vicinity to the surrounding transportation system smooth? |
| | | The satisfaction of livability and suitability requirements in the vicinity of the stations. | Is the quality of life around the stations peaceful, healthy, and of high quality? |
| | | The existence of effective mechanisms for capturing value. | What is the ability to capture land value appreciation within the context of existing development? |

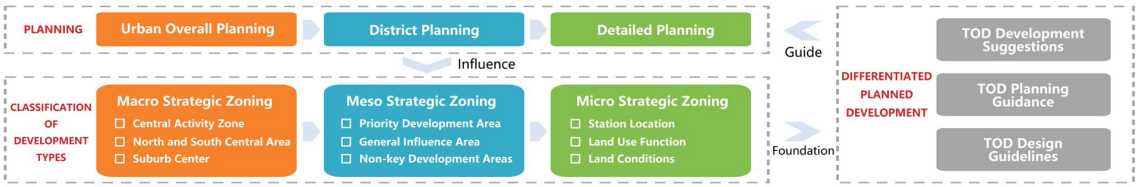
Source: Shenzhen Urban Transportation Planning and Design Research Center and Nikken Sekkei Research Institute, *Development and Implementation of Transit-Oriented Development (TOD) Strategies Guided by Public Transit at the Urban Level, and Project Management Support.*

The technical team used the macro, intermediate, and micro scales to evaluate conditions and plans at each TOD level—city, corridor, and station (figure 2):

- Macro: strategic zoning
- Intermediate: identification of key development areas and classification of development types
- Micro: identification of TOD types

By analyzing different regions and stations, this approach determined the most suitable TOD directions for each area. At the same time, it also ensured uniformity in TOD by establishing standardized criteria for stations in the same type of area.

**Figure 2: Analysis of Suitable Regions at Macro, Intermediate, and Micro Levels**




Source: Shenzhen Urban Transportation Planning and Design Research Center and Nikken Sekkei Research Institute, *Development and Implementation of Transit-Oriented Development (TOD) Strategies Guided by Public Transit at the Urban Level, and Project Management Support.*

## 4. City TOD Evaluation Results

The evaluation objectives at the urban level address comprehensive TOD issues in urban spatial development. The evaluation focuses on analyzing the relationship between the rail transit network, urban spatial development, and land development patterns.

The current rail lines align reasonably well with the urban spatial structure proposed in the 2002 version of the city's master plan. However, there is still a lack of support for the peripheral areas due to the limited scale of the rail transit network. Therefore, the new round of rail transit network planning closely coordinates with national spatial planning by introducing express lines and adding regular rail lines and stops, thereby better supporting the rapid expansion of urban space and important transportation corridors.

However, strategies must be fashioned to address the evaluations that have been produced in answer to the following questions:

*Question 1:* Does the layout of the rail network align with the urban spatial structure, and is the rail network efficiently accessible?

*Evaluation 1:* The planned rail network supports important transportation corridors within the city and accommodates the passenger flow characteristics of different urban zones. The coverage rate of rail stations relative to population and employment is high.[2]

*Question 2:* Does urban land development align with rail transit?

*Evaluation 2:* In the past, the correlation between land development and rail transit in some cities was insufficient. However, in recent years, nearly half of the new development projects have been centered around rail station areas. Nanchang City has implemented policies to increase the plot ratio around rail transit, but in practice, the guiding effect of rail transit on the plot ratio is not strong, and homogeneous development of new projects dominates.

*Question 3:* Is the transportation structure transitioning toward low-carbon transportation?

*Evaluation 3:* The proportion of green transportation in the overall travel structure has decreased, but in recent years, the number of vehicles that are powered by renewable energy has increased significantly.

The next section describes the strategies created in response to these evaluations.

2 The coverage rate for a station is the share of people within 1 kilometer of the station who can access it by walking.

## 5. Macrolevel Development Strategies

Macrolevel development strategies are proposed from the perspective of the entire city to achieve the overall development goals of TOD. The aim is to actively promote the coordinated development of land and transportation in regional spaces.

Strategies 1 and 2 respond to evaluations 1 and 2 above, respectively; strategies 3 and 4 respond to evaluation 3.

**Strategy 1: Zoning Development**

*Divide strategic zones to clarify the development directions and strategies of different regions.*

The technical team used factors such as national spatial planning, land use functions, and industrial layout to identify strategic zoning. Development guidelines are provided to guide the macro-level land development in each zone and coordinate urban spatial planning with the layout of the rail network.

**Strategy 2: Land Use Coordination**

*Optimize the layout of hubs and rail lines to align rail transit with land use.*

The technical team evaluated the layout of hubs and provided optimization recommendations to facilitate the integration of major transportation hubs with urban centers and resource aggregation and to enable the mixed development of land around rail stations. Mixed-use land development integrates functions such as commerce, office space, leisure, entertainment, sports, education, and healthcare.

For example, at Lushan South Avenue Station on Line 1, the TOD project has led to the construction of a large-scale commercial complex known as Metro Vanke Times Square. This multifunctional community meets the needs of residents for living, working, shopping, entertainment, commuting, and recreation. It alleviates the population burden and the pressure on resources and the environment in the central urban area. It contributes to optimizing the urban space, stimulating consumption and commercial activities and improving the efficiency of land use.

**Strategy 3: Integration of Public Transportation**

*Promote the continuous development of multimodal public transportation, with rail as the backbone, conventional buses as the basic network, and medium- to small-capacity vehicles as supplements.*

Prior to the complete development of the metro system, there should be convenient interconnection between the metro, conventional buses, and medium- to small-capacity vehicles as supplements. A well-established public transportation system facilitates passenger transfers, reducing travel time and cost. Once the metro network becomes the backbone of urban transportation, the role of conventional buses will shift to providing connections to it. Emphasize seamless spatial integration with other modes, such as bus rapid transit (BRT). Improve the quality, efficiency, safety, and user-friendly character of the system and thereby create a virtuous cycle between public transportation ridership and benefits. Promote pedestrian-friendly green travel as part of a cluster-based development pattern.

**Strategy 4: Low-Carbon Development**

*Enhance the existing ecological environment of sites and encourage low-carbon transportation options, including low-carbon upgrading of private cars and public buses.*

The technical team focused on urban natural assets and biodiversity, evaluated the service value of natural assets, and guided green development policies. Explore the correlation between TOD and low-carbon city construction. Low-carbon development methods are proposed for different types of TOD blocks, including measures for direct and indirect carbon reduction and low-carbon management. For undeveloped land, high-value ecological land is preserved or developed in the form of landscape land to prevent arbitrary destruction of natural ecosystems. For developed land, ecological enhancement and transformation are carried out.

## 6. Macrolevel Development Strategy Zones

The peripheral areas outside the central urban area of Nanchang have significant potential for implementing TOD. Most of the outer ring areas of the central urban area consist of developed land. When implementing TOD in those areas, the focus should be on renovating existing construction. The core areas of the central urban area also have a high proportion of developed land, but TOD in these areas should prioritize quality improvement.

Nanchang has already formed an industrial layout based on automobile and electronic equipment manufacturing, food processing, textile and clothing, and biomedicine among others. The city's unregulated expansion has led to the placement of some industries in the central area, resulting in conflicts with the city. To integrate industry and urban development, the current distribution and development trends of industries in Nanchang should be considered when formulating the urban TOD strategy. TOD can fully leverage the positive impact of rail transit on the industrial layout.

**Four Zones and Selected Areas**

Variations in conditions and functional positioning of the zones produce varying development goals to be achieved through TOD. For Nanchang's TOD strategy, the technical team has identified four zones plus a group of areas with common characteristics suitable for TOD. The four zones are Central Vitality Zone (West Honggutan District), Central Vitality Zone (East Old Town District), North-South Main City, and Suburban City (figure 3).[3]

*Central Vitality Zone (West Honggutan District)*

This zone aims to create a high-quality central business district. It focuses on improving urban functions and supporting transportation facilities, concentrating high-intensity development zones and commercial functions around rail transit stations and bus interchange hubs. This area is a key TOD strategy zone for promoting high-density mixed-use development.

*Central Vitality Zone (East Old Town District)*

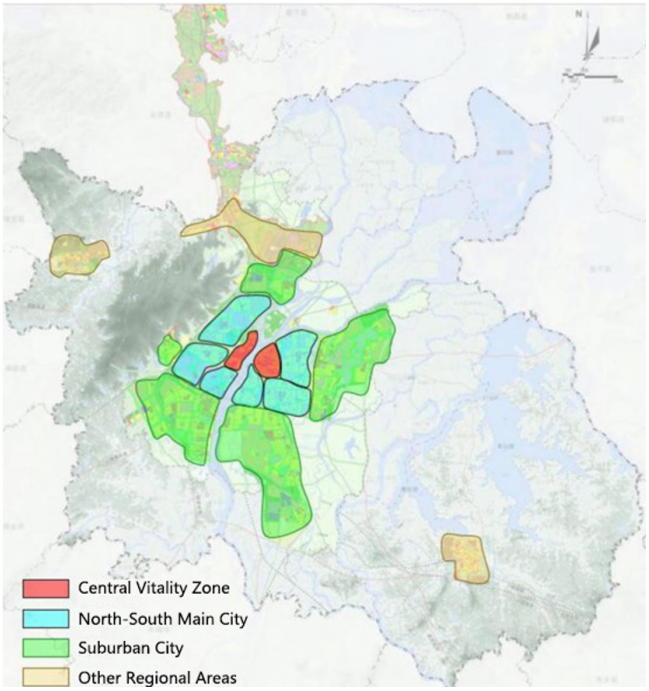
This zone focuses on environmental improvement and transportation management, adhering to principles of rational layout, resource conservation, and environmental friendliness. It aims to comprehensively enhance the service level and livability of the central area of the old town, including transportation involving high-intensity demand management.

3 A vitality zone in general contains a diversity of population, businesses, and cultural and entertainment resources.

### *North-South Main City*

This zone relies on TOD for revitalization and transportation improvement of the old town. It emphasizes strengthening the service of main rail transit lines, improving the road network structure, and supporting high-intensity development demands after the expected population increase resulting from urban renewal. The model adopts rail transit as the backbone with last-mile bus connections and medium-intensity demand management.

**Figure 3: Macrolevel Development Strategy Zones**




Source: Shenzhen Urban Transportation Planning and Design Research Center and Nikken Sekkei Research Institute, *Urban Development at the City Level with Public Transit-Oriented Development (TOD) Strategy: Formulation, Implementation, and Project Management Support.*

### *Suburban City*

*This zone focuses on key areas for urban incremental development. It uses the TOD concept to guide development along rail axes and station clusters. The development model involves rail transit as the backbone, regular buses and medium/small-capacity buses as the main modes and rail services for last-mile travel and low-medium demand management.*

### *Selected Areas*

*These areas rely on regional railways and highways to develop two urban belts—one for tourism towns and one for specialty industrial uses. The main mode of transportation is regular bus service and express bus lines to provide connectivity with core areas. Emphasis is placed on constructing internal bus feeder lines within the towns, which involves low-intensity demand management.*

## 7. Macrolevel Development within Urban Areas

Using the previous analysis of strategic zone influencing factors, the technical team has identified 13 TOD strategic zones within the urban areas.

- The Red Valley Beach Central District and Old Town Central District—these are suitable for developing comprehensive, high-quality, high-intensity urban centers.
- The Eastern City Area, Southern City Area, Chaoyang Area, and Hongjiaozhou Area—these are prioritized for TOD focused on a balance between new construction and improvement, emphasizing enhancing living service functions, and prioritizing residential renewal with balanced development intensity.
- Among peripheral/suburban areas, the Changleng Area, Jiaoqiao Area, Lehua Cluster, Wanli Cluster, Jiulong Lake Cluster, Liantang Cluster, and Yaohu Cluster, among others, are predominantly focused on new construction. These areas are suitable for the development of industrial-supporting cities with strict protection of ecological spaces.

**Example: Jiulong Lake Cluster**

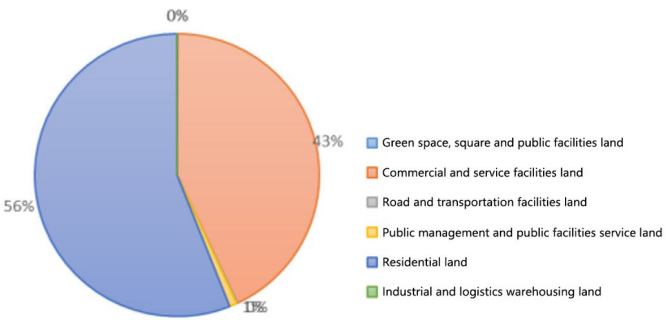
Taking the Jiulong Lake Cluster as an example, its planned positioning is as a livable new city that combines residential, tourism, public services, and transportation hub functions. As a peripheral area of Nanchang City, its GDP growth rate is higher than that of the urban area and is thus an important driving force for the city's economic growth. According to the *Statistical Yearbook of Nanchang City 2020*, the Jiulong Lake Cluster has consistently had one of the highest populations of all districts in Nanchang City. With the city's development, the transportation demand in this area will also increase. However, statistical results indicate a negative population growth rate. The area's capacity to attract population needs to be strengthened, and TOD is urgently needed to support the construction of the new city and promote population growth.

Jiulong Lake South Station, part of the Jiulong Lake Cluster, is a mixed-use station established under TOD principles, with surrounding land mainly dedicated to entertainment, commercial, and residential purposes (figure 4). Around the station, the Jiulong Lake Wetland Park, Nanchang Rongchuang Paradise, and the pedestrian linkage system create a strong attraction for slow-paced activities during weekends and holidays. There are nearby bus stops and ample parking lots around the station, making transfers between different modes of transportation convenient for passengers. However, compared with the old town area, the transportation facilities in this area are not yet fully developed, and there is still room for improvement in terms of pedestrian infrastructure.

**Figure 4: Land Characteristics of Jiulonghu Lake South Station**

a. Distribution of land types

b. Distribution of building types




Source: Shenzhen Urban Transportation Planning and Design Research Center and Nikken Sekkei Research Institute, *Final Report Rail Transit TOD Planning and Design Study (Appendix).*

The surrounding land parcels are mainly developed for tourism and leisure, with a relatively high proportion of commercial and service sector development. Between Shengmi Station and Jiulonghu Lake South Station, a large real estate project called Rongchuang Culture and Tourism City has been completed. The commercial operations in Rongchuang Culture and Tourism City are performing well, with a high occupancy rate observed during on-site visits (figure 5). Rongchuang Mao is closely integrated with the subway station, and the commercial development along the transportation routes is in good condition. However, the overall development intensity of these areas could be improved.

**Figure 5: Commercial Integration at Jiulonghu Lake South Station**

Source: Beijing Jiaotong University.

**Optimizing Rail Transit Layout**

Optimizing rail transit networks to better align with urban spatial development involves the following actions:

- Assure compatibility between urban spaces, transportation hubs, public service facilities, and rail transit networks.
- Optimize the layout of rail transit networks to support urban development and meet the diverse transportation needs of residents.
- Strengthen alignment with urban spatial structure: The network combines circular and radial patterns.
- Facilitate fast connections between peripheral areas and the central core, control travel time, and support the expansion of urban axes.
- Construct a ring line to serve radial passenger flows within the main urban area, improve network transfer efficiency, and promote urban integration.
- Enhance support for major transportation hubs such as airports and train stations. Improve coverage of essential public service facilities, including education, healthcare, sports, exhibitions, and tourist attractions, to facilitate convenient travel for residents.

**Building a Multimodal, Integrated Public Transportation System**

The *Comprehensive Urban Transportation System Plan of Nanchang City (2019–2035)* contains a well-designed public transportation system focusing on optimizing networks, integrating multiple modes, and ensuring traffic rights. Although Nanchang City's various modes of public transportation are operated by different entities (Nanchang Rail Transit Group and Nanchang Public Transport Corporation), Nanchang has established a collaborative platform for achieving seamless coordination among these modes, from route planning to actual operations. For example, the platform has facilitated *enhancements to the conventional bus system, including optimized bus stop locations and platform layout, higher frequency of service, reduced transfer times, and greater usage.*

# Part 2: TOD Strategy at the Corridor Level

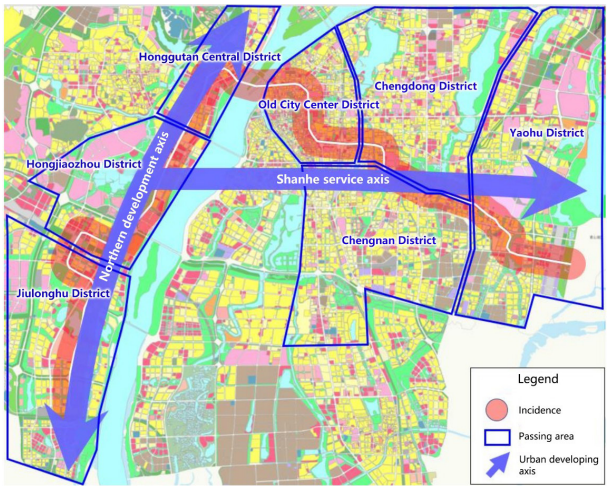
The corridor level analysis for Nanchang establishes a TOD influence range along rail corridors to improve its accessibility for the surrounding areas. For future extensions of rail transit, the TOD analysis provides suggestions on land development intensity and scale. Taking Metro Line 2 as an example, feedback received from its eastward expansion is used to illustrate how to maximize the benefits of rail transit in a corridor.x

## 1. Overview of Metro Line 2

Nanchang's Metro Line 2 is a backbone line within the rail network. It covers the most important areas along the north-south corridor between the old town in the south and the new town in the north. It passes through Bayi Square and connects the major external railway hubs of Gaoxin Passenger West Station, Nanchang Railway Station, and Nanchang East Station. It also aligns with the main axis of urban development in Nanchang, linking the south and north main urban areas. It can guide the construction of new urban areas, alleviate population pressure in the old city center, and support the transformation and upgrading of the central area.

Line 2 (including its eastward extension) passes through seven main districts (figure 6). The main development industries and functions of each district are as follows.

**Figure 6: Line 2 and Urban Functional Zones and Development Axes**




Source: Shanghai WSP Consulting and Shanghai Yisheng Management Consulting, *Final Report and Summary of Rail Transit TOD Planning and Design Study.*

**Layout of Seven Line 2 Districts**

South to north, along the northern development axis west of the Ganjiang River:

1. *Jiulonghu District (suburban area)*: An ecological livable new city driven by transportation hubs, focusing on developing new manufacturing industries that integrate business, finance, circulation services, innovation research, and development.
2. *Hongjiaozhou District (downtown)*: A science and technology center that also integrates higher education, sports and leisure, high-end residential, and tourism and leisure functions.
3. *Honggutan Central District (central vitality area)*: A center with multiple functions, including business, office, information, commerce, culture, tourism, and residential areas. It must be further developed to a higher standard to become a landmark area that embodies the 21st-century riverside urban style and image.

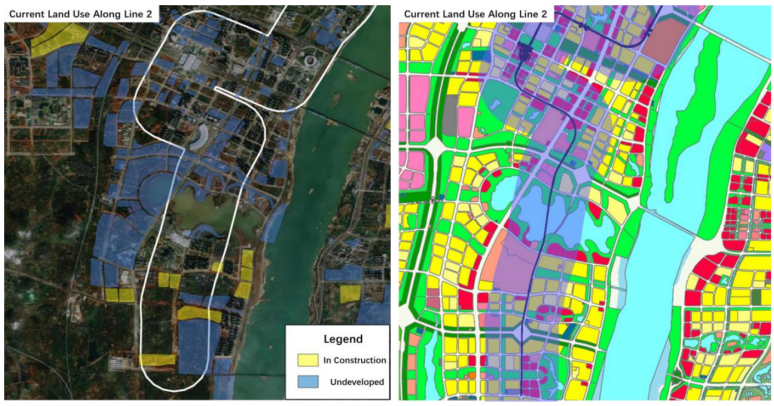
East to west along the Shanhulu service axis east of the Ganjiang River:

4. *Old City Center District (central vitality area)*: Nanchang's center for commercial services, finance and trade, administrative offices, cultural entertainment, and science and technology. The TOD planning for this area enhances tertiary industry such as commerce, finance, and science and technology. Polluting factories are to be gradually moved out of the old city area. Infrastructure and quality of the living environment are to be improved, and historical and cultural environments such as the Four Lakes are to be protected.
5. *Chengdong District (downtown)*: A new area for urban development and the improvement of supporting facilities. With existing colleges and research institutes in the Nanchang High-Tech Industrial Development Zone, technology-intensive industries are to be developed, especially those with high added value. Enhance the Qing Shanhu and Aixi Lake Scenic Areas to make the district an ecological and environmentally friendly new area integrating science, technology, education, high-tech industries, commerce, logistics, and residential functions.
6. *Chengnan District (downtown)*: The district is home to large enterprises such as Jiangling Motors and Nanchang Aviation. The planning focuses on forming additional dominant automobile, aircraft, and motorcycle manufacturing enterprises, along with logistics and warehousing support and residential areas.
7. *Yaohu District (suburban area)*: Use natural landscapes such as Ai Xi Lake and Yaohu to form a high-quality university park with an attractive waterfront surrounding a high-tech industry export processing zone.

**Land Analysis along the Corridor: The Kowloon Lake Area**

The section of Line 2 from Nanlu Station at the southernmost end of the west bank of the Ganjiang River to Nanchang West Station passes through the Kowloon Lake Area. Except for the territory around Kowloon Lake South Station, the Kowloon Lake Areais mostly undeveloped. The plan positions the Kowloon Lake Area as a livable new city including residential, tourism, public service, and transportation hub functions. Residential land is distributed all along Line 2, with a concentration in the section from Nanlu Station to Kowloon Lake South Station. There are also some residential areas on both sides of Nanchang West Station. Commercial land is concentrated in the Kowloon Lake Tourism Area and around Nanchang West Station (figure 7).

**Figure 7: Comparison of Current Land Development and Land Planning in the Kowloon Lake Area**




Source: Shanghai WSP Consulting and Shanghai Yisheng Management Consulting, *Urban Rail Transit TOD Planning and Design Research: Final Report and Summary.*

In terms of square meters of residential, commercial, and office space, the built area within the influence range of Line 2 in the Kowloon Lake area is expected to about double in the coming years (table 2). The population within the range is expected to grow far more, from about 6,500 to 100,000 people, aligning with the population transfer trend in Nanchang.

**Table 2: Planned Growth of Building Areas in the Vicinity of Line 2 in the Kowloon Lake Area, by Land Use Type**

| Land Use Type | Current Building Area ($m^2$) | Planned Building Area ($m^2$) | Change (percent) |
|---|---|---|---|
| Administration, Public management and public service | 892,141 | 1,681,629 | 88 |
| Business, commercial and service | 2,166,489 | 4,412,855 | 104 |
| Residential | 4,226,907 | 8,173,824 | 93 |

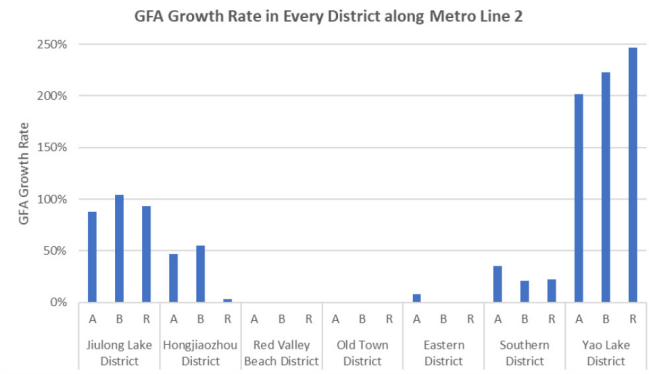
Source: Shanghai WSP Consulting and Shanghai Yisheng Management Consulting, *Urban Rail Transit TOD Planning and Design Research: Final Report (Appendix).*

In comparing the planned growth rates of major building types in each area, the Yao Lake and Jiulong Lake areas show significant increases (figure 8). The TOD development model requires high-intensity, dense, and mixed-use land development, and these two areas have great potential for land development as they are either in the early stages or have just entered the development phase. However, making adjustments according to TOD development requirements is challenging for the middle three districts shown in figure 8, where development is largely complete.

### Coordination with the Conventional Bus System

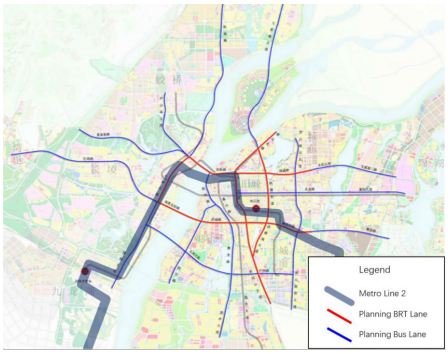
The uncoordinated relationship of the conventional bus system in Nanchang City and Metro Line 2 (figure 9) has created a suboptimal level of passenger flow on Line 2. That, in turn, harms TOD along the Line 2 corridor. The two modes need to be more functionally positioned.

**Figure 8: Planned Growth Rates of Building Area for Zones along Metro Line 2**




Note: GFA = gross floor area. A, B, R categories = Administration, Business, Residential.
Source: Shanghai WSP Consulting and Shanghai Yisheng Management Consulting, *Final Report and Summary of TOD Planning and Design for Rail Transit.*

**Figure 9: Layout of Planned Bus and Bus Rapid Transit Lanes in the Vicinity of Line 2 (2012–20)**



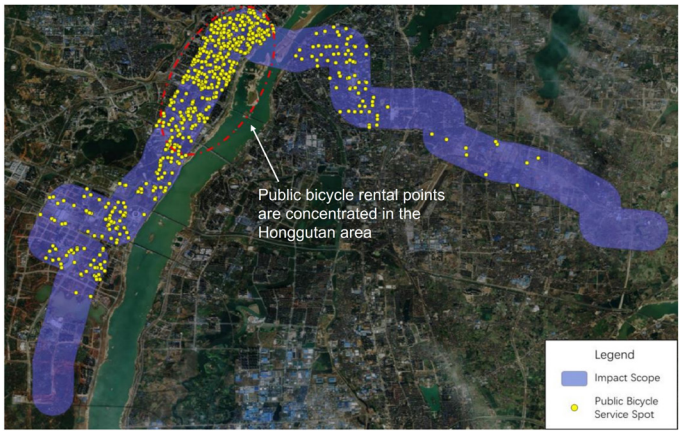

Source: Shanghai WSP Consulting and Shanghai Yisheng Management Consulting, *Final Report and Summary of TOD Planning and Design for Rail Transit.*

### Walking Routes and Bicycle Access

The walkability of the pedestrian network around the stations of Line 2 should be improved. The actual walkable range within a 10-minute walk is only about three-fourths of the 800-meter radius around the stations. In the areas west of the Gan River, the blocks are more significant in scale with larger building footprints, making it difficult for pedestrians to cut through the buildings. In the areas east of the Gan River, many dead-end roads and few entrances and exits in old residential areas and courtyards create enclosed spaces where pedestrians cannot pass through. These problems directly or indirectly result in a reduction of the walkable range.

The distribution of public bicycle rental points is uneven within the 800-meter radius of each station along Line 2 (figure 10). The number of public bicycle rental points in the core area of Honggutan is significantly higher than in other areas, such as the Kowloon Lake area, the old city core area east of the Gan River, and the area east of Xinjia'an Station.

**Figure 10: Public Bicycle Rental Points within 800 Meters of Line 2 Stations**




Source: Shanghai WSP Consulting and Shanghai Yisheng Management Consulting, *Final Report and Summary of TOD Planning and Design for Rail Transit*.

## 2. Medium-Term Development Strategy

The medium-term development strategy is guided by the macrolevel strategy developed above. Its key features are (1) adjusting land use around Line 2 stations to enhance the value of land along the corridor and promote economic development and (2) integrating the modes of transportation around the corridor to reduce the environmental impact of the transportation system.

**Land Adjustment Based on Land Use Plan**

According to the *Nanchang City Master Plan for Land Use (2019–2035)*, the Line 2 corridor will connect the Kowloon Lake area, Hongjiao Island area, Honggutan Central District, Old City District, Chengdong District, Chengnan District, and Yaohu District. According to the TOD project's land control thematic study along the eastern extension of Metro Line 2, the planned adjustments for the land generally within 800 meters of the stations along the eastern extension (figure 11) are as follows:

- *Jiefang West Road Station:* A residential station. The planning adjustment suggests increasing the development intensity around the station and adding commercial development based on the existing plan, converting Class 2 residential land into mixed-use land.
- *Chengnan Avenue Station:* The overall layout around the station remains largely unchanged; one area is recommended for transformation into commercial land.
- *Jiefang East Road Station:* Efforts to improve the efficiency of land utilization around the station are recommended, along with a change for one parcel from Class 2 residential land to commercial facilities land.
- *Dongsheng Avenue Station and Changdong Avenue Station:* The overall station layout remains mostly unchanged, with increased commercial development to promote efficient land use.
- *Luojia Middle Road Station:* Transportation facilities will be converted into commercial facilities land. This will involve land transfers and changes to the nearby road network.
- *Luojia Second Road Station:* The planned adjustments include commercial trade, business offices, cultural and entertainment facilities, information consulting, residential areas, and related supporting facilities. The plan also fulfills the requirements of building a secondary center of city life in the southeast of the Chengdong area and improving public support services.

**Figure 11: Land Use Adjustment around Stations of the Line 2 Eastern Extension**


Source: Shanghai WSP Consulting and Shanghai Yisheng Management Consulting, *Final Report and Summary of TOD Planning and Design for Rail Transit.*

### Integrated Transportation along the Corridor

The integration of multiple modes of transportation is illustrated here by the example of bus and slow (walking, bicycling, and e-biking) modes along Line 2 in the Kowloon Lake and Jiulong Lake areas.

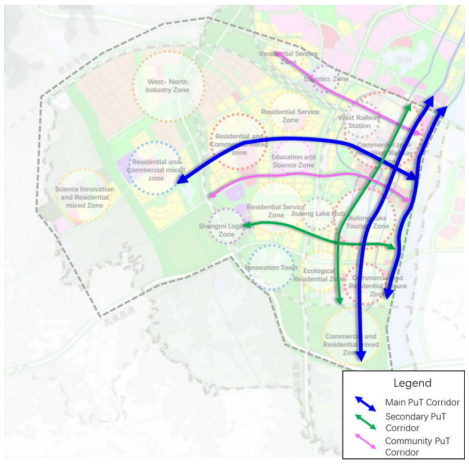
#### *Bus System Demand Analysis*

The bus demand along Metro Line 2 in the Kowloon Lake area is mainly concentrated in the north-south connections between the eastern clusters and in the connections between the eastern clusters and the western clusters. Three north-south bus corridors are set up, including two main bus corridors and one secondary bus corridor (figure 12). Four east-west bus corridors are established, including one main bus corridor, one secondary bus corridor, and two community bus corridors.

#### *Bus Lane Plan*

The analysis of travel demand and the identification of bus corridors led planners to add several bus lanes to enhance connectivity within the area (figure 13): the new Shangrao Street bus lane to strengthen east-west connections; the new Yichun Street bus lane to strengthen the east-west connections on the southern side of the area; and the extension of the existing West Station Street bus lane to the west to serve the West Station commercial cluster. The planned regional and rail network developments led to extending the bus lanes on Jiulong Avenue and Ganjiang South Avenue to Rail West Ring Road; and extending the Sanqing Mountain Avenue lanes to the southernmost part of the area.

**Figure 12: Layout of Bus Corridors along Line 2 in the Kowloon Lake Area**




Source: Shanghai WSP Consulting and Shanghai Yisheng Management Consulting, *Final Report and Summary of TOD Planning and Design for Rail Transit.*

**Figure 13: Layout of Bus Lanes along Line 2 in the Kowloon Lake Area**

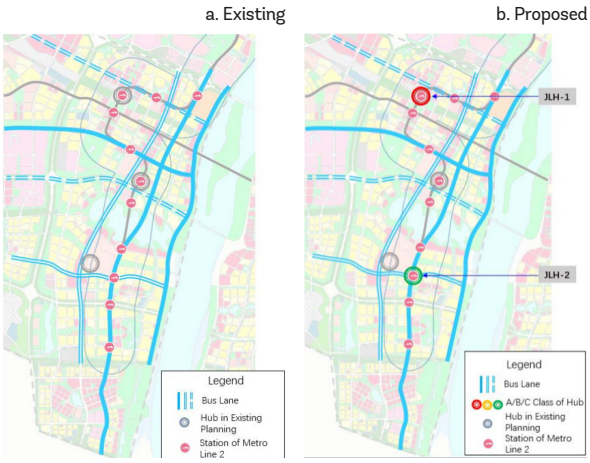

Source: Shanghai WSP Consulting and Shanghai Yisheng Management Consulting, *Final Report and Summary of TOD Planning and Design for Rail Transit.*

### *Bus Hub Plan*

Two bus hubs, JLH-1 and JLH-2, have been identified for the Jiulong Lake area (figure 14):

- JLH-1: A grade-A hub. Leveraging the presence of the large Nanchang West Station facility on Line 2, this hub is designed to accommodate rail stations, bus terminals, and seamless transfers. It aims to maximize passenger flow aggregation; support the development of surrounding commercial, office, and residential areas; and serve as a core for TOD.
- JLH-2: A grade-C hub primarily centered around the Line 2 Shengmi Station. Positioned in the core area of the Jiulong Lake tourism cluster, it will be adjacent to the Rongchuang Mall and Rongchuang Amusement Park. It includes a medium-sized bus terminal and is supported by the intersection of the Sanqing Mountain Road bus lane and the Yichun Street bus lane.

**Figure 14: Existing and Proposed Bus Hubs along Line 2 in the Jiulong Lake Area**




Source: Shanghai WSP Consulting and Shanghai Yisheng Management Consulting, *Final Report and Summary of TOD Planning and Design for Rail Transit.*

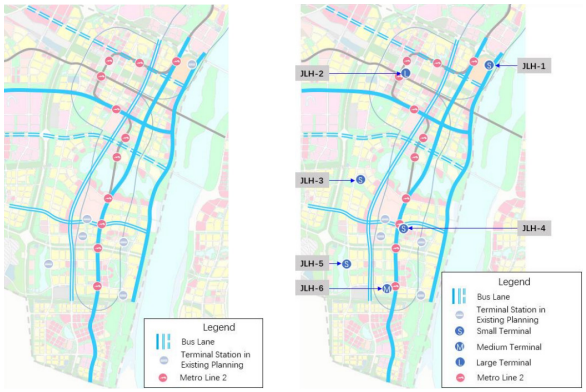
### *Bus Terminal Plan*

Taking into account the hub locations and the land use structure of the area, adjustments have been made to the existing plans for bus terminal locations (figure 15). Note: Bus terminals JLH-1 and JLH-2 are distinct from the previously described bus hubs with the same names.

- JLH-1: A small-scale bus terminal planned at an existing terminal. It is situated in the National Sports Center area, adjacent to the Ganjiang Avenue bus corridor and serves the surrounding land primarily used for public services and residential purposes. It is approximately 600 meters in a straight line from the Guotizhongxin Station on Line 2.
- JLH-2: Planned as a new, large-scale bus terminal. It is situated north of the South Square (plaza) of the West Station on Line 2. It serves as a comprehensive bus interchange hub for multiple systems and lines, including Nanchang West Station, Line 2, and Line 4, in an area including significant commercial and residential land.
- JLH-3: Planned as a new, small-scale bus terminal. It is designed to be developed in conjunction with the comprehensive residential cluster west of Jiulong Avenue, south of Fuzhou Street, east of Fengsheng Expressway, and north of Yichun Street.
- JLH-4: Planned as a new, medium-scale bus terminal. It is designed to be developed in conjunction with residential complexes, optimizing bus transfers in the southern tourist area of Jiulong Lake, in coordination with the Shengmi Station transportation hub.
- JLH-5: A small-scale bus terminal planned at an existing terminal. It is situated on the west side of Longhu Mountain Avenue, next to Nanchang Military Theme Park, and primarily serves the surrounding parks and residential clusters.

**Figure 15: Existing and Proposed Bus Terminals along Line 2 in the Jiulong Lake Area**

a. Existing b. Proposed




Source: Shanghai WSP Consulting and Shanghai Yisheng Management Consulting, *Final Report and Summary of TOD Planning and Design for Rail Transit.*

### *Slow-Mobility Demand Analysis*

Running along Fenghe South Avenue, Line 2 forms a particular point of interest for slow mobility where it crosses the Jiulong Lake Wetland Park between Jiulonghu South Station and Shimin Zhongxin Station (figure 16). Nanchang West Station and West Station South Square are in a commercial and trade-integrated zone heavily used by slow-mobility modes. The National Exhibition Center and National Sports Center are high-demand leisure destinations on weekends and holidays.

### *Slow-Mobility Planning*

A regionally integrated slow-mobility connector system is planned in the Jiulong Lake area (figure 17). The plan connects the Jiulong Lake Riverside public space with slow-mobility greenways, providing an attractive environment for leisure and fitness activity. The greenway system also connects to commercial and large-scale public buildings. The plan adheres to the principle of combining nature and moderate development to maintain the vitality of waterfront spaces.

**Figure 16: Slow-Mobility Demand in the Jiulong Lake Area**


Source: Shanghai WSP Consulting and Shanghai Yisheng Management Consulting, *Final Report and Summary of TOD Planning and Design for Rail Transit.*

**Figure 17: Slow-Mobility Plan in the Jiulong Lake Area**


Source: Shanghai WSP Consulting and Shanghai Yisheng Management Consulting, *Final Report and Summary of TOD Planning and Design for Rail Transit.*

### *Pedestrian Network Planning*

Five pedestrian trail types are planned as part of the Jiulong Lake slow-mobility zone structure:

- *Leisure Landscape Trails:* Ecological greenways with an excellent natural environment and abundant green resources; or commercial recreational paths with a vibrant atmosphere.
- *Urban Transportation Trails:* Main roads with strong transportation functions and relatively few shops or businesses, including Jiulong Avenue, Longxing Street, and Fuzhou Street.
- *Urban Living Trails:* Primary and secondary roads with a good an array of resident-centric amenities and services, high pedestrian flow, and friendly street interfaces, including Sanqingshan Avenue, Ganjiang South Avenue, Shangrao Street, and Yingtan Street.
- *Community Living Trails:* Secondary roads and side streets with a good an array of resident-centric amenities and services, moderate pedestrian flow, and friendly street interfaces, including Jiujiang Street, Chengyun Road, Fengshun East Street, and Tongle Road.
- *Community Extension Trails:* Extensions and expansions of the pedestrian network, mainly distributed in the small road network of the Jiulong Lake area, ensuring pedestrian-friendly and accessible environments.

### *Nonmotorized Network Planning*

Four route types are planned for nonmotorized (bicycle and e-bike) travel: paths, corridors, pathways, and extensions (figure 18):

- *Paths:* These are ecological greenways with a good natural environment and abundant green resources for recreational bicycling. They ensure smooth and continuous cycling routes with sufficient shading and clear signage.
- *Corridors:* These meet the conditions for long distance, continuity, and good connectivity, serving as intermediate connections.
- *Pathways:* These secondary lanes connect the corridors, providing internal accessibility within the area.
- *Extensions:* These are supplements to the nonmotorized transportation network on primarily slow-mobility side streets.

**Figure 18: Nonmotorized Transportation Network Plan in the Jiulong Lake Area**


Source: Shanghai WSP Consulting and Shanghai Yisheng Management Consulting, *Final Report and Summary of TOD Planning and Design for Rail Transit.*

### *Pedestrian Crossing Plan*

The plan covers intersection crossings and zero-accident pedestrian safety zones.

- *Intersection crossings:* Designs here aim to reduce points of conflict between pedestrians and vehicles. In some cases, the green light for vehicles may be delayed relative to the walk signal to allow pedestrians to be more readily seen by turning drivers.
- *Zero-accident pedestrian safety zones:* These street segments feature measures such as speed bumps and raised crosswalks to reduce vehicle speeds that will shorten the crossing distance for pedestrians and force turning vehicles farther away from the curbs.

# Part 3: TOD Strategy at the Station Level

To apply the process of TOD planning at the station level in Nanchang, the research team selected the 10 stations along the extension of Rail Transit Line 2. The analysis defined the boundaries of TOD around each station and identified key areas within those boundaries. An evaluation system called the 4V model was developed to assign optimal dominant functions to be attained at each station area through TOD.

The resulting station-area plans are based on applying the model through a layered process including an evaluation of existing conditions and advantages of the areas and an analysis of risk, financials, and competitiveness conditions among transit modes.

The technical team developed planning and design guidance and phased implementation plans for four of the 10 stations. The guidance and plans constitute a model of how to achieve financially stable, green, livable outcomes for an urban core and periphery through urban rail transit projects integrated with complementary urban land development.

## 1. Overview: Advantages and Challenges of the Station Areas

The project analyzed the station areas in terms of the distribution of natural resources, patterns of land ownership, the supply of cultural assets and public space, the distribution of functions, and the state of transit service.

**Abundant Natural Resources but Inadequate Integration with TOD**

The eastern extension of Line 2 is surrounded by rich natural resources, with scenic spots and parks in Nanchang located within 10 kilometers of the corridor. The northern side of the corridor includes Qing Shan Lake Scenic Area, Aixi Lake Wetland Park, and Yao Lake Forest Park; the southern side includes Xiang Lake Scenic Area and Ba Da Shan Ren Plum Lake Scenic Area. According to the city's latest *Nanchang Greenway and Blueway Plan (2019–2035)*, only the urban greenways planned around Shenqiao Station, Fengxia Station, and Hufang Station are connected to nearby urban green parks, while other stations lack greenway connections and fail to integrate into the overall landscape pattern of the city, thereby failing to use the surrounding ecological resources effectively.

**Complex Land Ownership and a Significant Amount of Planned and Reserved Land**

The land ownership and development conditions are relatively complex around stations such as Xinjia'an, Lengshang, Chengnan Avenue North, Lixiang, Shenqiao, and Luojiapu. A significant proportion of the land cannot be used because development plans have already been implemented or it is currently reserved. The proportion of undevelopable land in the eastern extension reaches almost 38 percent, including about 8 percent of land that is reserved, 15 percent that has been planned and implemented, 12 percent for partial updates, and 2 percent that has been sold. About 42 percent of land is available for development, including land to be sold and for overall updates.

**Lack of Plans for Preserving Cultural Assets and for Connections among Them**

A substantial amount of life service facilities and historical and cultural resources exist within 1 kilometer of the stations. The western side, from Xinjia'an Station to Shenqiao Station, is mainly composed of commercial and public service facilities, including Nanchang Aviation University, Tianxiang Garden, Wanda Plaza, Longhu Tianjie Shopping Mall (under construction), and Sangong Temple. From Fengxia Station to Nanchang East, the eastern side mainly consists of historical and cultural resources, including Guanyin Temple, Wentong Temple, and six relocated historical dwellings. A lack of detailed plans for protecting and using cultural relics has suppressed the amount and quality of development of the Sangong Temple area around Lixiang Station and of the six relocated dwellings around Hufang Station. In particular, no systematic, high-quality walking environment has been created between cultural and leisure facilities and the stations along the eastern extension.

**Adjustment of Urban Functions along the Rail Corridor still Needed**

The configuration of commercial and business facilities around the stations does not match the actual demand, yielding high vacancy rates. The plot ratio around some stations does not vary much with distance, contradicting the TOD concept and failing to leverage the development-driving role of the stations.

**Transit Weaknesses**

*Insufficient Station Accessibility*

On average, only about 33 percent of the population within 1 kilometer of the stations can access the stations by walking (planned to reach about 58 percent), and the average density of the road network is only about 4.3 km/km$^2$ (planned to reach about 7 km/km$^2$). Nonetheless, the planned density of the road network still only barely meets the requirement of MoHURD's *Guidelines for Planning and Design of Urban Areas along Rail Transit Lines*, which stipulates that the density of road networks around rail transit corridors should be above 6–8 km/km$^2$.

*Inadequate Bus Coverage and Coordination with Rail*

The bus routes align with the eastern extension of Line 2, but the surrounding areas lack good bus stop coverage—only 52 percent of the population within 1 kilometer of the stations have a walking distance to the nearest bus stop shorter than 300 meters—and the coordination between bus and rail systems is inadequate. The number of bus stops will be insufficient to meet TOD demands; hence, space for more bus stops must be reserved.

*Thin Slow Mobility Systems*

Comprehensive pedestrian and bicycle networks should be built to strengthen access to rail stations, and the density and safety of pedestrian facilities should be increased. According to the city's Nanchang Urban Greenway Network Plan, the eastern extension of Line 2 is connected to only one greenway. Increasing the density of greenways and other slow-transit routes would help support TOD along the corridor; so would adding bicycle pick-up/drop-off points within 800 meters of the stations to enhance the connection between bicycles and the rail line. Some stations have mixed traffic on the streets, with pedestrian crossings marked with stripes but with no other pedestrian protections.

## 2. Station TOD Positioning: Xinjia'an

The technical team has undertaken TOD positioning of the areas around the stations along the Line 2 east extension on the basis of their existing level and type of development and their resource endowments. The positioning process is illustrated here by using Xinjia'an Station as an example.

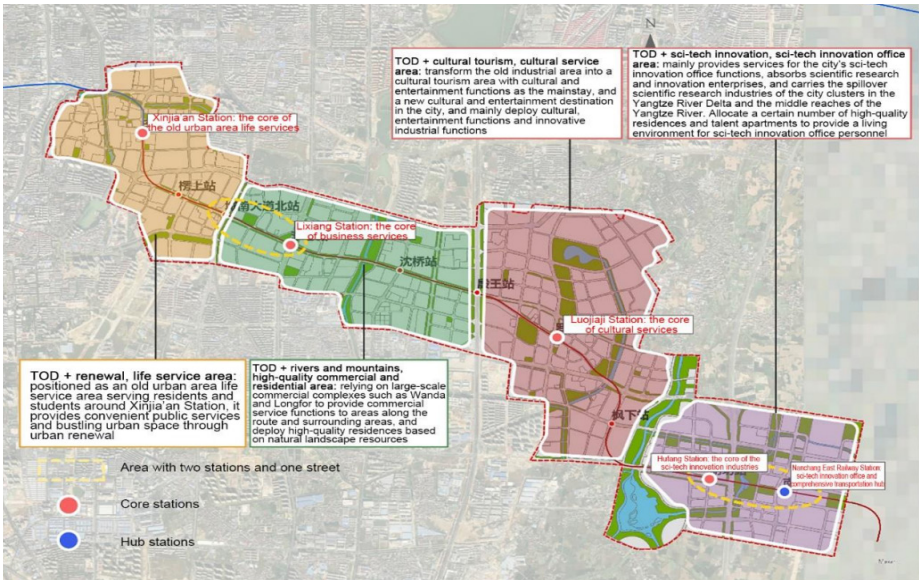
**Industrial Development Positioning**

The area around Xinjia'an Station, located in the old city area, will be used to promote the digitization of the traditional textile and apparel manufacturing industries as well as the digital upgrading of service industries and urban renewal—for example, the plan envisions breakthrough "smart" developments for the area in education, healthcare, cultural creativity, and tourism. The positioning also promotes the creation of demonstration zones for the "internet celebrity" economy and for the digital transformation of the textile and apparel industries.

**Functional Positioning**

The technical team divided the Line 2 east extension into four functional zones on the basis of resource endowments and future development directions (figure 19). Xinjia'an Station is in the living service zone combining TOD and renewal. This type of zone is positioned as a service area to enhance the efficiency and convenience of everyday living for residents and students. The technical team leveraged the existing built environment, explored available land for renewal, and introduced commercial and public service facilities to provide diverse functions and services, creating a pleasant urban scale and enhancing the quality and vitality of the area.

**Figure 19: Functional Zoning of the Line 2 East Extension**




Source: China Sustainable Transportation Center and Beijing Urban Construction Design Group, *Research Report on Station Area Planning Based on TOD Concept of Rail Transit.*

### The 4V Model and Site Function Prediction

In the context of China's goal of "carbon peak" and "carbon neutrality," the technical team conducted in-depth research on resource endowments and public preferences along the Line 2 east extension. The work showed that ecological value should be the fourth value in the 4V model for evaluating rail transit stations' development level and functional positioning (table 3).

**Table 3: Construction of the 4V System**

| Type of Value | Indicator | Calculation Method | Weight |
|---|---|---|---|
| Node | Node accessibility | Coverage within 30 minutes of rail and walking | 0.25 |
| | Number of bus routes | Number of bus routes stopping within 200 meters of the rail station | 0.25 |
| | Accessibility to public service facilities | Total number of points of interest covered within 30 minutes of rail and walking | 0.25 |
| Place | Walkability within 10 minutes | Proportion of coverage within 800 meters' walking distance from the rail station | 0.25 |
| | Functional mix | Entropy of points-of-interest information within 800 meters of the rail station | 0.25 |
| | Coverage of public service facilities | Weighted sum of public service points of interest within 800 meters of the rail station | 0.25 |
| | Ground floor density | Ground floor density of street-level shops within 800 meters of the rail station | 0.25 |
| Market | Construction intensity | Gross plot ratio within 800 meters of the rail station | 0.16 |
| | Employment-to-residential ratio | Employment-to-residential ratio within 800 meters of the rail station | 0.16 |
| | Population accessibility | Population covered within 30 minutes of rail and walking | 0.16 |
| | Potential development land | Inefficient land area within 800 meters of the rail station | 0.5 |
| Ecological | Nonhardened area | Permeable surface area within 800 meters of the rail station | 0.5 |
| | Construction energy consumption coefficient (-) | Total construction volume within 800 meters of the rail station | 0.5 |

Note: Indicators are applied to area within 800 meters of a rail station. The negative value on the construction energy consumption coefficient indicates that, the higher the construction intensity, the lower its ecological value.
Source: China Sustainable Transportation Center and Beijing Urban Construction Design Group, *Research Report on Station Area Planning Based on TOD Concept of Rail Transit.*

Summing the scores of the indicators for each value in the 4V model produced a score for that value, and the scores were divided into four ranges: high, moderately high, average, and low. The 10 stations on the Line 2 east extension with high and moderately high scores for each of the values (node, place, market, and ecological) value were classified with the following advantages (table 4 and figure 20):

- Node: Transportation
- Place: Life service
- Market: Development
- Ecological: Ecological environment

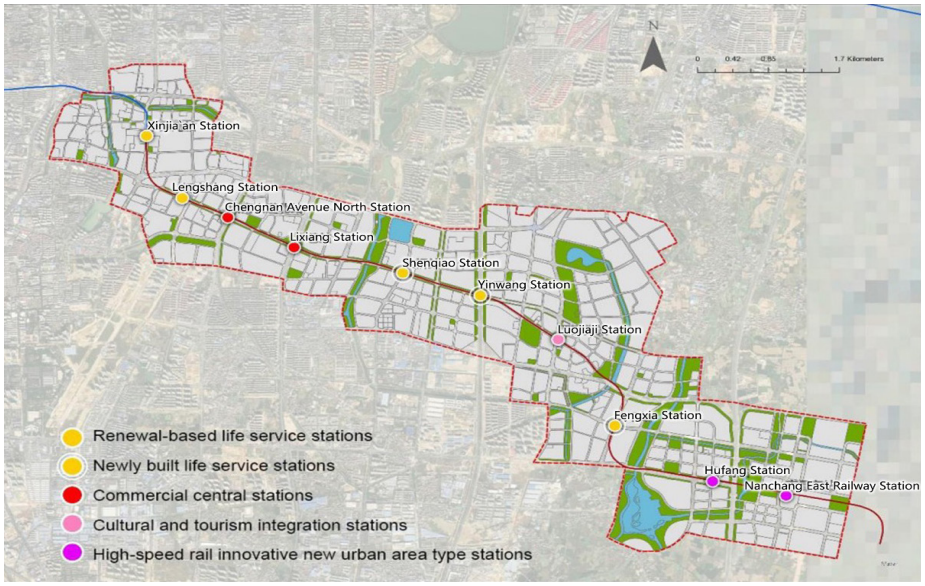
Xinjia'an Station is one of the stations with life service advantages, and based on previous analysis, its area is positioned explicitly for urban renewal focused on life services.

**Table 4: Evaluation Results for the 4V Model**

| Site Name | Node Value | Node Value Evaluation | Place Value | Place Value Evaluation | Market Value | Market Value Evaluation | Ecological Value | Ecological Value Evaluation | Total Score | Type Judgment |
|---|---|---|---|---|---|---|---|---|---|---|
| Xinjia'an Station | 0.18 | Higher | 0.20 | High | 0.05 | Lower | 0.07 | Lower | 0.50 | Traffic+Life |
| Lengshang Station | 0.14 | Normal | 0.14 | Higher | 0.05 | Lower | 0.08 | Normal | 0.41 | Life |
| Chengnan Avenue North Station | 0.20 | High | 0.14 | Higher | 0.05 | Lower | 0.08 | Normal | 0.47 | Traffic+Life |
| Shenqiao Station | 0.19 | Higher | 0.11 | Normal | 0.07 | Higher | 0.09 | Normal | 0.47 | Traffic+Development |
| Lixiang Station | 0.21 | High | 0.17 | High | 0.08 | Higher | 0.07 | Normal | 0.53 | Traffic+Life+Development |
| Nanchang East Railway Station | 0.50 | High | 0.05 | Lower | 0.13 | High | 0.24 | High | 0.93 | Hub+Development+Ecology |
| Hufang Station | 0.12 | Normal | 0.07 | Lower | 0.13 | High | 0.22 | High | 0.55 | Development+Ecology |
| Fengxia Station | 0.14 | Normal | 0.12 | Normal | 0.12 | High | 0.19 | High | 0.57 | Development+Ecology |
| Luojiaji Station | 0.17 | Higher | 0.14 | Higher | 0.05 | Lower | 0.15 | High | 0.50 | Traffic+Life+Ecology |
| Yinwang Station | 0.17 | Higher | 0.10 | Lower | 0.03 | Lower | 0.11 | Higher | 0.41 | Traffic+Ecology |

Source: China Sustainable Transportation Center and Beijing Urban Construction Design Group, *Research Report on Station Area Planning Based on TOD Concept of Rail Transit.*

**Figure 20: Functional Positioning of Stations in the Line 2 East Extension**




Source: China Sustainable Transportation Center and Beijing Urban Construction Design Group, *Research Report on Station Area Planning Based on TOD Concept of Rail Transit.*

## 3. Guiding the Planning of the Xinjia'an Station Area

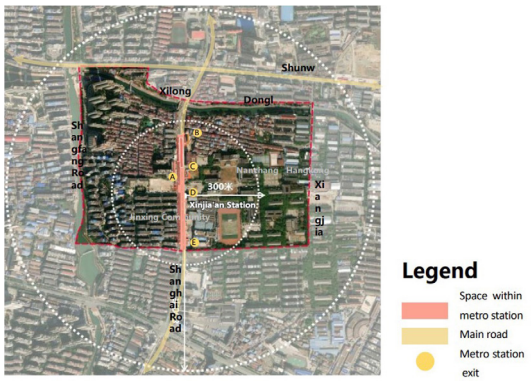
The results from the 4V model yield preliminary predictions on the function and positioning of the Line 2 east extension stations. The planning guidance for the Xinjia'an Station area is for urban-renewal-oriented TOD for life services (figure 21). The planning objectives for this type of station are to leverage the advantages of a modern, livable urban area, focusing on functional enhancement, quality improvement, cultural leadership, and digital empowerment as the main drivers of urban renewal. The goal is to create a 15-minute walkable living circle and establish a people-friendly TOD station that is livable for all ages and throughout the lifespan. Doing so involves improving infrastructure, optimizing public spaces, strengthening urban design creativity, integrating new industries and formats, and constructing a harmonious urban living environment that integrates production, life, and ecology.

**Analysis of the Current Situation in the Area**

The area surrounding Xinjia'an Station is in the southwest corner of the eastern part of the city, and it is designated as a locale for developing and transforming high-value-added industries. Within 800 meters of the station, the land is devoted predominantly to residential and educational uses, with much of the remainder including commercial, business, and supporting public service facilities. It is an extension and radiation area for the old city's residential and public service functions. Shanghai Road, where the station is located, exhibits both traditional and innovative urban cultural characteristics, with some alley streets preserving the original urban style. Except for the eastern side of the station, the existing land use plan designates much of the area as predominantly residential along with intermittent commercial, administrative, and public service uses.

The eastern side of Xinjia'an Station is designated as a higher education campus area, with commercial and business uses along the street. The Nanchang University of Aeronautics and Astronautics is already near the east side of the station, and the population there is accordingly relatively young. The large number of bicycles and other nonmotorized vehicles used to access the rail station overwhelms the designated parking spaces for them, and the resulting overflow clogs the already narrow pedestrian space in front of the station (figure 22).

**Figure 21:** Planning and Design Scope of Xinjia'an Station




Source: China Sustainable Transportation Center and Beijing Urban Construction Design Group, *Final Report on Station Area Planning Research Based on the TOD Concept.*

**Figure 22:** Narrow Pedestrian Space at the Entrance of Xinjia'an Station

Source: Beijing Jiaotong University.

**Planning Concept**

To address the development issues surrounding Xinjia'an Station, such as the large number of existing buildings, increasing traffic pressure, and the narrow public space in front of the station, the research team focused on the economic feasibility of urban renewal and considered the current market conditions in Nanchang. The team emphasized the principle of "one station, one strategy" in the planning process, avoiding the rigid application of typical TOD intensity and functional layout. Instead, they focused on enhancing the urban structure and spatial environment through TOD renewal. The proposed strategy includes the following elements:

- *Functional mixing:* Prioritize the layout of public spaces and public service facilities, creating neighborhood centers around green spaces, plazas, etc.
- *Moderation of development intensity:* Create open and comfortable residential communities while controlling regional construction density.
- *Convenient commercial service:* Guide the diversion of pedestrian flow around the station, create comfortable and smooth homecoming routes and suitable consumer paths, and encourage pedestrian-friendly internal traffic environments.
- *Continuity of public space:* Shape open ecological spaces and create a public space system that connects riverside parks, allowing the city to embrace the waterfront.
- *Economic and social assessment of demolition:* Analyze the costs of demolition and flexibly divide the land designated in higher-level plans, preserving some buildings that present more significant challenges.

To better implement the above renewal strategies, a new public space system must be established, creating a clearer system of public movement called the S-P-R (Station-Park-Riverside) corridor. The S-P-R corridor will focus on connecting the rail station to parks and, farther on, to the public corridor along the riverside. This system will be supported by transportation strategies, commercial service interfaces, ecological space layouts, and related urban management measures, such as removing barriers between the river and the city.

**Comprehensive TOD Planning and Design**

In the comprehensive TOD area, new construction will have a total floor area of 295,000 square meters, including commercial, residential, hotel apartments, office, cultural and educational, and public transportation facilities. On the east side of Xinjia'an Station (Exit C), a business and commercial complex will be developed around the green plaza space to enhance the area's vitality and land value.

The northeast exit of the subway station (Exit B) will connect to the parkland. Adjacent land parcels will accommodate a civic and cultural center and a smart service hall to complement the adjacent commercial land parcels and plazas. The southeast exit of the subway station (Exit D) will combine with the recently completed shopping space to create a contemporary and distinctive cultural and creative street block. The area will encompass commercial, office, research and development, and hotel apartment functions. Adjacent to universities, it will provide a high-quality living and employment environment for young talents.

The transportation land on the south side of the Exit D parcel, in conjunction with the planned Exit E of the subway station, will be developed into a commercial and transfer complex, including commercial retail, catering, office spaces, and bus transfers, effectively guiding transfer flows into the commercial district.

The residential parcel on the east side of the subway station along the river will be developed into a waterside international community, featuring multistory terrace houses facing the water. The residential parcel on the west side of the subway station along the street will accommodate community commercial functions, while the northern part, with a high-value waterfront landscape, can be used for youth apartments, long-term rental apartments, and policy-based affordable housing.

**Transportation System and Connectivity Design**

Planning the interface of transportation modes at the station involves road realignments and additions, creating transfer facilities, and making new connections between the subway station and surrounding commercial areas (figure 23).

*Road Network Planning*

After evaluating the demolition of existing buildings, roads are added to improve accessibility around the newly planned commercial areas and public service plots. The road hierarchy system consists of main roads, urban branch roads, and road redlines (where prohibitions on stopping facilitate bus travel). Lower-level branch roads are planned within the community clusters to minimize through-traffic disturbance and create a people-centered, pedestrian-oriented transportation system.

**Figure 23: Integrated Transportation Planning around Xinjia'an Station**


Source: China Sustainable Transportation Center and Beijing Urban Construction Design Group, *Final Report on Station Area Planning Research Based on the TOD Concept.*

*Integration of Transportation around the Rail Transit Station*

Xinjia'an Station is in the middle of Shanghai Road and is not directly connected to an intersection. It has four entrances/exits, with two on each side of Shanghai Road. The plan recommends integrating underground connections with adjacent commercial parcels to enhance the convenience of services at the rail transit station. The connections would create a continuous public corridor featuring areas of commerce, ecology, and waterfront.

Xinjia'an Station also serves as a transfer station for the future Line 6 of the rail transit system. As a transfer station, it will include nonmotorized vehicle stops, bus stops, and bus terminals covering an area of nearly one-half hectare. The bus terminal, integrated with commercial buildings on the north side of the rail station, will include commercial, retail, dining, office spaces, and bus transfers, effectively guiding transfer flows into the commercial complex, enhancing the vitality of the area, and increasing the value of the land.

# Part 4: Summary of Achievements

The GEF-6 China TOD project in Nanchang applied advanced international TOD concepts to Nanchang's specific characteristics and development trends. The resulting analysis yielded development strategies and related planning guidance for the city's future direction at the city, corridor, and station levels. The results are summarized here by the project team at Beijing Jiaotong University.

## 1. Key Successes

The Nanchang project created a comprehensive set of well-defined, quantifiable evaluation indicators to support the implementation of TOD strategies. The indicators serve as a bridge between objectives and strategies, providing specific quantification of overall goals. The evaluation system follows a macro–intermediate–micro approach, combining qualitative and quantitative assessment methods. The technical team conducted region-specific analyses at the urban, corridor, and station levels, including strategic zoning at the macro level, identification of key development areas and classification of development types at the intermediate level, and identification of TOD types at the micro level. By analyzing different regions and stations, the evaluation achieves an appropriate degree of differentiation of TOD while maintaining overall consistency.

**Focus on Integration of Transport Systems Rather than Blind Expansion**

The previous development path has been associated with continuous growth in population motor vehicle traffic in Nanchang. Taking inspiration from experiences in Denver, Colorado, and Portland, Oregon, the Nanchang project encouraged the integration of public transportation modes—with rail as the main component—combined with slow modes (pedestrian and bicycle travel) in the city center. Hence, the focus was not solely on expansion but on integrating existing rail lines with conventional buses and slow-mode systems. The strategy is to continuously develop public transportation and build a multilevel integrated public transportation system.

**Strong Integration with Land Use Planning for Enhanced Operability**

TOD projects preceding the GEF-6 effort primarily focused on the comprehensive development of land around individual rail stations. However, cities are increasingly integrating rail transit plans with land use planning, conducting comprehensive TOD studies for entire rail lines and networks at citywide scale. Such studies can help optimize the selection of station locations, land use allocation, and construction methods and help formulate top-level TOD designs and implementation paths.

In Nanchang, TOD closely aligns with overall land use planning. At the macro level, strategic zoning is based on land use potential and is consistent with land use planning. The corridor zoning at the intermediate level considers existing land use planning, functional positioning, and land analysis, resulting in differentiated development strategies and detailed planning for integrated transportation along the corridor. At the micro level, priority is given to the upper-level planning of stations and their surrounding areas by analyzing and identifying different types of nodes, such as the main city center, subcenters, and living centers.

**Industrial Development Positioning Based on TOD Concepts and Nanchang's Characteristics**

The positioning of the industries surrounding the stations on the extension line of Line 2 integrates the characteristics and advantages of each station, forming an adaptive industrial system under the TOD concept. Leveraging the agglomeration effect and economic radiation effect of rail transit increases overall employment opportunities along the corridor, thereby promoting population concentration. The technical team adopted a qualitative analysis method using *three dimensions* to establish an industrial pool based on *two orientations* for screening, resulting in the determination of an industrial system.

The three dimensions are future industrial development trends, TOD industrial development directions, and local industrial plans. The two orientations are characteristic agglomeration/innovation and entrepreneurship. Through public participation and surveys indicated ecological environment, lifestyle, and transportation preferences for the future development of the TOD corridor. Using carefully surveyed public opinion helps create a people-oriented living environment.

## 2. Directions for Continued Improvement

The development of TOD-oriented, low-carbon cities, both domestically and internationally, focuses on low-carbon energy systems, urban spatial forms, and travel modes. The Chinese government has launched environmental reform systems through low-carbon city pilot programs such as the GEF-6 China TOD project to achieve sustainable urban development. Over the past decade, Nanchang has made significant progress in transitioning toward a low-carbon economic structure. The TOD concept manifests itself through promoting compact urban land use, public transportation, and eco-friendly and sustainable urban development. To achieve the low carbonization of TOD at the urban and site levels, it is necessary to establish long-term plans that ensure quality of life and sustainable development.

**Strengthening TOD to Promote Work-Life Balance**

The overall TOD planning vision emphasizes the principle of work-life balance. The balance is reflected in some station-level planning in which a compact living space is combined with mixed-use multifunctional units. TOD planning breaks the conventional development axis of single and relatively independent transportation corridors by connecting corridors and functional areas, thereby promoting the circulation and interaction of urban space and improving the efficiency of land use. This approach can reduce large-scale commuting caused by the separation of work and residence and decrease long-distance travel.

The Jiulonghu South station aims for intensified land use through the "railway + property" model while maintaining the ecological characteristics of the surrounding Jiulonghu area; this approach provides more employment opportunities for Nanchang residents and simultaneously improves work-life balance.

In the future, at the corridor or city level, better work-life balance, including shorter commuting times, can likewise be attained with land-use strategies and real estate policies that adjust residential and commercial land ratios.

**Accelerating the Development of the BRT System and Improving Bus Connections**

The construction period for rail transit is relatively long, typically taking four to six years for a single line and requiring substantial investment. According to Nanchang's second-round urban rail transit network planning, the Jiulonghu area will not have the desired urban rail transit network in place until 2050. However, before the subway elements are built and put into operation, acceleration of plans to create the bus rapid transit (BRT) system in the Jiulonghu area will deliver multiple benefits while the wider the public transportation system is fleshed out: The BRT will serve as a backbone for connecting peripheral areas, cultivating passenger flow for the future subway system, and providing transportation support for the rapid economic development of the Jiulonghu area.

In the future, the comprehensive development and improvement of the Nanchang BRT system will promote higher public transit usage rates between rapidly developing urban areas, expand the coverage of the bus network, strengthen the integration of trunk roads, BRT systems, and rail transit, and create a comprehensive transportation corridor system along major development axes and key traffic corridors. This will meet the diverse transportation needs along the main corridors, promoting coordinated development between urban land use and transportation systems.

## 3. Conclusion

Nanchang's existing rail transit network structure is highly compatible with the urban spatial structure, and the rail transit construction has yet to cover the entire developed area. Therefore, pursuing supplementary development that follows the traffic and land use patterns becomes an important task. This situation is typical and representative of urban areas in developing countries worldwide. As the central city of the Yangtze River Midstream and Downstream City Cluster, Nanchang acquired valuable experiences in the TOD project that can assist in cross-river development between new and old districts.

Nanchang is also a provincial capital with a significant potential for population growth and a large amount of available land. The exploration of TOD in this project, especially the locally derived initiatives that deeply integrate Nanchang's development features, are highly relevant for TOD in cities of similar scale in China and in other developing countries.

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