



## PROJECT PROGRESS (As of March 21, 2022)

### MOHURD

■ **GEMH-01A:** *“Development and Application of TOD Policies, Technical Standards, and Management Tools in Chinese Cities”* — All six modules of national TOD platform have been completed, including resource library, information, diagnostics, planning, monitoring, and impact assessment. Platform prototype has passed expert review. Module integration, testing, and adjustments are expected to be completed by the end of 2022. The TOD platform is required to receive a security clearance grading before online operation. The procurement plan and work outline for the grading task will be submitted to the World Bank for approval in Q2 2022. On March 15, 2022, MOHURD PMO visited Longfor to promote the national TOD platform and discussed the possibility of integrating the “Longzhi Zhizao” building information modeling (BIM) system with the national TOD platform.

### Beijing

■ **GEBJ-1A:** *“Preparation and Implementation of City-Level Transit-Oriented Development (TOD) Strategy and Project Management Support”* — The intermediate output (Tasks 1-4) was submitted to the World Bank on January 22, 2021. Annual acceptance of work for the TOD guidelines (Task 5) and the action plan and operational manual (Task 6) was completed on December 29, 2021.

■ **GEBJ-2:** *“Corridor-Level and Station-Level Application of TOD Strategy: Research on Optimization of Rail Transit Lines and Land-Use Based on TOD Principles”* — For Task 2, the research output has been reviewed by experts and submitted to the World Bank. For Task 3, the

research on comprehensive design framework for key stations along Tongzhou-Miyun Line is underway, and an expert review is scheduled in June 2022. Task 3 team is organizing public participation events. All tasks under the contract are expected to be completed by the end of 2022. The research team held a seminar with experts from the Beijing Municipal Institute of City Planning & Design.

■ **GEBJ-3:** *““District-Level Application of TOD Strategy: Urban Regeneration of Life Science Park Near Jingzhang HSR and Changping Metro Line”* — An expert review meeting for Task 2 “The Comprehensive Planning and Transformation Study of the Urban Renewal Area around Rail Transit Stations” was held on August 25, 2021, and the research output has been submitted to the World Bank in October. In December 2021, the research team held a seminar with the Nantong rail transit comprehensive development research team. Task 3 “Comprehensive Assessment of Environment and Social Impact on Urban Renewal Areas around Rail Transit Stations” is underway, and all tasks will be completed in March - April 2022.

### Tianjin

■ **GEFTJ-1:** *“Preparation and Implementation of City-level Transit-Oriented Development (TOD) Strategy and Project Management Support for Tianjin”* — Work related to Task 9 “Environment and Social Safeguards” is currently underway. On December 21, 2021, the research team discussed technical issues with Beijing PMO on the work in progress.

■ **GEFTJ-2: “Research on Financing a Tianjin Urban Rail Transit Project Applying TOD Principles”** — The “Economic Evaluation Study on the Integration of Parking and TOD around Rail Transit Corridors” and “Summary Report” were submitted to the World Bank in February 2022. In March 2022, an expert review on the “Economic Evaluation Study on the Integration of Parking and TOD around Rail Transit Corridors” and “Summary Report” was held, and the reports are being revised in accordance with expert opinions. All tasks under the contract will be completed by the end of 2022.

■ **GEFTJ-3: “Tianjin Jianchangdao Area Rail Station - Planning and Design Research Project based on TOD Principles”** — In February 2022, Task 4 “Comprehensive Development Research Report” was completed. On February 22, 2022, the research output was presented to the Housing and Urban-Rural Development Commission of Hebei District, urban investment corporations, and China Railway Construction Group. In March 2022, Task 5 “Integrated Transit System Research Report” and Task 6 “Public Space and Urban Quality Enhancement Research Report” were completed. All tasks under the contract will be completed by the end of 2022.

## Shijiazhuang

■ **GEFSJZ-1: “Preparation and Implementation of City-Level Transit-Oriented Development (TOD) Strategy and Project Management Support for Shijiazhuang”** — The expert review for the final output was completed on October 29, 2021, and the group meeting to solicit opinions was held on December 3. The final review was completed on December 13. By the end of 2022,

the environmental and social safeguards report will be completed, and the completion report will be reviewed and submitted to the World Bank.

■ **GEFSJZ-2: “Land Adjustment Plan for Shijiazhuang Urban Rail Transit Line 4”** — Drafts for Subtasks 1-3 have been completed by February 2022. During March 9-10, 2022, the project team solicited opinions from the leadership of Shijiazhuang city government for the aforementioned drafts. By the end of this year, all research output under the contract will be reviewed and submitted to the World Bank.

■ **GEFSJZ-3: “Research on Applying TOD Strategies to Five Stations and Three Areas Located to the North of Shijiazhuang East Station”** — Tasks 1-3 are currently underway, and the expert reviews are scheduled in May 2022. By the end of this year, research outputs under the contract will be submitted to the World bank after review.

## Nanchang

■ **GENC-1A: “Preparation and Implementation of City-Level Transit-Oriented Development (TOD) Strategy and Project Management Support for Nanchang”** — On January 7, 2022, a public seminar was held to discuss the “Nanchang TOD Strategic Planning Report”. The research team has been revising the report according to the suggestions from participants.

■ **GENC-2A: “Study of TOD Planning and Design for Rail Transit”** — The first draft and abridged version of the final report were submitted to the World Bank on January 28, 2022, and the report will be reviewed by experts in April 2022. All tasks under the contract are expected to be completed by the end of 2022.

### ■ GENC-3B: “*Study of TOD-Based Regional Planning around Rail Transit Stations*”

— On December 9, 2021, the research output of Task 1 was submitted to the World Bank. On February 9, 2022, Task 2 “Regional Stakeholder Analysis Report” was submitted and currently being revised according to the suggestions from the World Bank task team. On March 9, Task 3 “Research Report on Domestic and International Best Practices” was submitted. All tasks under the contract are expected to be completed by the end of 2022.

■ GENC-4A: “*TOD Concept Promotion and Knowledge Dissemination*” — The task outline was published on November 24, 2021. Due to the limited number of consulting firms that submitted letters of intent, the PMO adjusted the submission deadline to 10:00 a.m., December 24. On January 6, 2022, three consulting firms were shortlisted after review. The shortlist review report has been uploaded to the World Bank STEP system. On January 29, a call for tender was sent to the shortlisted candidates. The technical proposal review was conducted on March 9, and a financial proposal review was conducted on March 15.

## Ningbo

### ■ GENB-1: “*Study on TOD Strategies in Ningbo*”

— Workshops and expert pre-review meetings for Tasks 5-6 have been completed. The outline for the strategic social and environmental safeguards assessment report has entered the compilation stage after reviewed by internal experts. The research team will revise the drafts of Tasks 5-6 in accordance with the pre-review opinions, then start writing the general report. All tasks under this

contract will be completed by the end of 2022. On March 3, 2022, the project team held a seminar on the Ningbo TOD Strategic Research Project. More than 50 participants from the Municipal Development and Reform Commission, Ningbo Bureau of Natural Resources and Planning, Ningbo Housing and Urban-Rural Development Bureau, Ningbo Municipal Finance Bureau, Shenzhen Urban Transport Planning Center, and Deloitte attended the meeting.

■ GENB-2A: “*Consulting Service regarding TOD Implementation for Kaiming Street (Yaoting Street-Zhongshan Road), Xinjie Street, and Shuangliang Community*” — The strategy report has been completed and is ready for expert review. The work plan for 2022 includes holding project seminars, organizing capacity building and field trips.

■ GENB-2B: “*Research on Financing Schemes of TOD Implementation for Kaiming Street (Yaoting Street-Zhongshan Road), Xinjie Street, and Shuangliang Community*” — The special bond + PPP realization model research report and documents required for special bond application have been prepared. The required documents include but not limited to the “Project Expected Income and Financing Balance Plan”, “Financial Evaluation Report of the Expected Income and Financing Balance Plan”, and the “Legal Opinion on Project Bonds”. The work plan for 2022 includes research on the PPP “two assessments+ one plan” which is expected to be completed in May, and research on the confirmation of underground spatial rights which is expected to be completed in October.

### ■ GENB-3: “Study of TOD-based Regional Planning round Rail Transit Stations” —

Discussions, an expert review, and a bilingual Chinese-English draft have been completed for Task 4. The research team has started working on Task 5 which is expected to be completed by the end of June. Task 3 is expected to be completed by the end of the year.

## Guiyang

■ GEFY-1: “Preparation and Implementation of City-Level Transit-Oriented Development (TOD) Strategy and Project Management Support for Guiyang” — Task 3 “Guiyang TOD Implementation Plan and Greenhouse Gas Accounting Proposal” was completed and passed expert review. Task 4 is currently underway.

■ GEFY-2: “Study on the TOD Comprehensive Development Planning for Areas along the Rail Transit Line S1 Phase I and Line 3 Phase I Project in Guiyang City” — The “Comprehensive Development Planning and Research Report for Areas along Rail Transit Line” has been completed, which includes an analysis of the development potential of current land use, analysis of the real estate market along the railway lines, understanding and interpretation of existing plans, case studies and planning design concepts, typology of railway stations, site function positioning, and intensity regulations. The “Research Report on the Integrated Transit Planning of Areas along Rail Transit Line” has been completed, which includes a survey of the current situation and transit characteristics, research on the integrated development of urban

land utilization and transport, and special research on the integrated development of regional public transit. The urban design plans applying TOD principles for the key stations of Huaxi South Station, Taohuazhai Station, Huansha Road Station, Wenquan Road Station, Luowan Station, and Shubo Avenue Station have been completed. The preliminary report for “Guiyang TOD Block Design Guidelines” has been completed, and research on the comprehensive development asset empowerment and revenue distribution mechanisms, along with TOD implementation process and policy support are being carried out.

■ GEFY-3: “Study on the TOD Comprehensive Development Planning for Areas along the Ring High-speed Railway in Guiyang City” — The research on comprehensive development planning and transit integration planning of areas along the urban ring high-speed railway has been completed. The conceptual urban design of Mengguan, Huaxi South, and Baiyun North Stations has been completed. Opinions from district governments have been solicited. The research report has been completed.

■ GEFY-4: “Strategic Environmental and Social Safeguards Assessment for TOD Planning and Research” — The contract was signed in September 2021. Guizhou Survey & Design Research Institute for Water Resources and Hydropower is implementing the contract. Immediate outputs including the policy analysis report, the status quo of the natural and social environment, impact analysis, and the development of indicator system are expected to be submitted by the end of March.

## Shenzhen

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■ **GESZ-1: “Preparation and Implementation of City-level Transit-Oriented Development (TOD) Strategy and Project Management Support for Shenzhen”** — Tasks 5 and 6 have been completed, and the research team is drafting the strategic report for Task 7. The outline of the strategic environmental and social safeguards assessment report has been reviewed and revised, and the task team is writing the first draft. By the end of this year, the review of Tasks 5-7 will be completed and the outputs of Tasks 8-10 will be produced. On December 17, 2021, the project team held a seminar on “Social Safeguard Assessment in TOD Implementation”.

■ **GESZ-2A: “Research for the Sustainable Development Planning and Construction Management of the Bainikeng Community Based on TOD Principles”** — Research on the planning and design, financing, and implementation plan of stations of Tasks 6-9 has been completed. The Bainikeng TOD model and practice summary of Task 10 is being carried out. The outline of the strategic environmental and social safeguards assessment has been revised. By the end of this year, the review of Tasks 6-10 will be completed and the outputs of Tasks 11-13 will be produced.

## PROJECT IMPLEMENTATION PROGRESS (AS OF MARCH 21, 2022)

PMO	Activity	Draft TOR	Final TOR	Bidding Announcement	Shortlist Review	Bid Evaluation	Contract Negotiation	Contract Signing	Inception Report	Intermediate Output	Draft Final Report	Final Report
MohURD	National TOD Platform											
Beijing	City-level TOD Strategy											
	Corridor and Station-level TOD Application											
	District-level TOD Application											
Tianjin	City-level TOD Strategy											
	Research on Private Sector Engagement in TOD Financing											
	District-level TOD Application											
Shijiazhuang	City-level TOD Strategy											
	Corridor-level TOD Application											
	District and Station-level TOD Application											
Nanchang	City-level TOD Strategy											
	Corridor-level TOD Application											
	Station-level TOD Application											
	TOD Promotion and Knowledge Dissemination											
Ningbo	City-level TOD Strategy											
	District-level TOD Application											
	District-level TOD Application											
	Station-level TOD Application											
Guiyang	City-level TOD Strategy											
	Corridor-level TOD Application											
	Corridor-level TOD Application											
	Strategic Environmental Assessment for Corridor-level TOD Application											
Shenzhen	City-level TOD Strategy											
	District and Station-level TOD Application											

**LEGEND**

Colored cells indicate the progress of each project. Green cells indicate progress from January 1, 2022 - March 21, 2022.

## CAPACITY BUILDING AND ACADEMIC EXCHANGES

On December 29, 2021, the Guangdong Engineer “Yangcheng Action” - “Yangcheng Craftsman Cup” 2021 Guangzhou TOD Integrated Development and Innovation Contest Finals was held at the Guangzhou Rail Industry Development Center. Relevant authorities and practitioners from Guangzhou Federation of Trade Unions, Municipal Development and Reform Commission, Municipal Land Development Center, and Baiyun District Planning and Natural Resources Bureau participated in this contest. The theme was “city- and people-oriented development.” The main subjects of the contest were Solutions and Management, focusing on the challenges of business digitalization, relocation, upgrade, and transformation, as well as the development of integrated transportation hubs. Entry, “Revitalization of the Entry and Exit Space of Guangzhou Subway Stations,” submitted by the joint team of Guangzhou Urban Planning & Design Survey Research Institute (GZPI) and the Institute for Transportation & Development Policy (ITDP) won the championship. [\(Relevant Link\)](#)



(Image Source: Guangzhou Municipal Planning and Natural Resources Bureau)

On March 1, 2022, the “Station-City Integration Upgrade Model” special research team of the TOD Committee of China Society of Territorial Economists (CSOTE) visited Beijing Infrastructure Investment for a research discussion. During the discussion, Beijing Infrastructure Investment

introduced relevant case studies of “Rail Transit +” station-city integration. They also outlined the problems and challenges posed by primary implementers, approval process, and land planning policies of station-city integration projects. Beijing Municipal Commission of Housing and Urban-Rural Development and Beijing Municipal Commission of Planning and Natural Resources introduced the progress and existing challenges of planning and construction in urban renewal that involves station-city integration. They also provided countermeasures and suggestions for these challenges. Participants expressed that station-city integration would serve a critical role in urban renewal. In the progress of global cities’ urban renewal, such as Tokyo and New York, the transformation and enhancement of transit systems has enabled a substantial increase in urban passenger capacity. In conclusion, to facilitate station-city integration, it would be necessary to improve the approval process and planning policies and facilitate station-city integration development under urban renewal. [\(Relevant Link\)](#)



(Image Source: CSOTE)

On March 10, 2022, the E-town New City Spatial & Digital Planning Laboratory was jointly established by Beijing Municipal Institute of City Planning & Design and City Planning & Environment

Design Research Center of Beijing Economic-Technological Development Area (E-town). A strategic cooperation agreement was signed. The Lab adopts a co-construction model in which the two parties will adhere to the principles of information sharing, knowledge sharing, planning and research, and scenario co-construction. They will carry out in-depth exchanges and cooperation in planning and design, innovative research and

development, industry development, and talent management. They will also closely follow the development of cutting-edge technologies. The parties will actively promote the innovative planning, construction, and management of cutting-edge technologies such as big data, artificial intelligence (AI), digital twins, and 3D simulations to achieve the objectives of technology and policy innovation. [\(Relevant Link\)](#)

## INDUSTRY NEWS

### Metropolitan Region on Rail

On January 5, 2022, the Guangzhou Daily Data & Digit Institute (GDI Think Tank) and Guangzhou Metro Design & Research Institute jointly developed and released the “Guangzhou Urban Rail Transit and Regional Integrated Development Report” (hereinafter the “Report”). Taking the Guangzhou-Foshan Line as the case for analysis, the Report is the first to use big data and spatial network technologies to outline analysis and evaluation indicators of the ability of rail-transit-driven socio-economic development. It focuses on the role of rail transit in facilitating urban integration and urbanization of the Guangdong–Hong Kong–Macao Greater Bay Area (GBA). Data shows that Guangzhou ranks first in the GBA in terms of the quantity and coverage of urban rail lines. In terms of rail transit travel time between Guangzhou and other cities in the GBA, the Report shows that the average travel time from Guangzhou to other cities is less than 1 hour by rail transit, except Huizhou, which is a little bit over 1 hour. In the future, Guangzhou is expected to achieve the goal of traveling to all cities in the GBA within 1 hour. [\(Relevant Link\)](#)

On January 16, 2022, the construction of Foshan Urban Rail Transit Line 4 Phase 1 started. The Line starts from Beijiang Avenue Station, passes through Chancheng District, Sanshui District, and Nanhai District, and terminates at Gangkou Road Station. This line has a total length of 55.2 km, with 33 stations and a designed speed of 100 km/h. As the east-west main line of the Foshan Rail Transit Network, the project is of great significance for the facilitation of urban rail transit network in Foshan. It will drive the integrated development of the Guangzhou-Foshan economic circle and accelerate the construction of urban clusters in the GBA. [\(Relevant Link\)](#)

On January 17, 2022, the transport data release by the Ministry of Transport shows that there were 35 new urban rail transit lines added and an expanded length of 1,168 km in 2021. The number of railway lines has increased 15% comparing to 2020. Luoyang, Shaoxing, Jiaying, Wenshan, Wuhu, Jiaying (Haining), and Zhenjiang (Jurong) opened urban rail transit lines for operation for the first time. In 2021, passenger volume increased to 6.12 billion, which is a 35% increase comparing

to 2020 and a 99.2% increase comparing to 2019. The ridership per kilometer was about 8,200 for an average day in 2020, which is a 14% increase comparing to 2020 and a 28% decrease comparing to 2019. [\(Relevant Link\)](#)

On February 24, 2022, civil works resumed for all 107 projects of Suzhou Rail Transit. By the end of this year, the tunnelling shield for Line 6 will be completed, and 40% of the track construction will be completed. Main structures of stations on Line 7 will be 70% completed and 45% of the tunnelling shield will be completed. Main structures of stations on Line 8 will be 80% completed and 60% of the tunnelling shield will be completed. The S1 Line will carry out testing and adjustments for equipment and operation of all related elements. [\(Relevant Link\)](#)

On February 25, 2022, track laying for the third phase of Hefei Rail Transit Line 1 commenced. Starting from Tianshui Road Station and ending at Hefei Railway Station, the project features a total length of 12.315 km of underground track. [\(Relevant Link\)](#)

### Development of Integrated TOD Projects

On December 21, 2021, Wuhan Metro Group introduced eight key TOD projects, including Sanyang Road, Qinyuan Road, and Huangpu Road projects. The total area of these projects is around 640,000 m<sup>2</sup>. Sanyang Road, Qinyuan Road, and Xujiapeng projects will focus on business development, while Huangpu Road, Zhaojiatiao, Gedihu, Fozuling, and Zhonghang Jiedaokou projects will focus on integrating business centers, transit centers, and education centers in urban area. [\(Relevant Link\)](#)

On January 12, 2022, the 2021 Summary and Promotion Meeting of Chengdu's 10 Projects for a Happy and Beautiful Life and Livelihood was held. At the meeting, key work plans and projects for Chengdu in 2022 were announced, one of which was an urban commuting efficiency enhancement project. In order to improve the efficiency of urban commuting, Chengdu will facilitate the construction of 34 TOD projects and new urban rail lines (S5 and S11). [\(Relevant Link\)](#)

On February 16, 2022, the primary structure of Land Lot 6 of the Shuangliu West Station Integrated TOD Project undertaken by China MCC5 Group was completed. The project moved onto the secondary framing, installation, and renovation stage. The project is located in Areas 5 and 6 of Banqiao Community, Shuangliu District, featuring a total gross floor area of 92,000 m<sup>2</sup> and consisting of 2 commercial and 12 residential buildings. The Shuangliu West Station TOD project connects subway lines 3, 10, and 17, along with a high-speed rail line and an international airport. [\(Relevant Link\)](#)

### Transport Hub Development

On December 15, 2021, the Hangzhou West Railway Station Hub West Section II viaduct was fully connected. The viaduct is made up of a total of 33 cast-in-place beams and 10 steel box beams. Its total length is around 3.8 km. The west side is connected to the main line of Dongxi Avenue, while the east side is connected to the west drop-off point of the station building. The West II Section will serve as the core transit line for the rapid entry and exit of the west side of Hangzhou West Railway Station. [\(Relevant Link\)](#)

On January 13, 2022, the 12th Hunan Provincial Party Congress proposed the implementation of a strategy to build a provincial capital with strong transportation network and construct a national-level comprehensive transportation hub. The Changsha Airport renovation and expansion project and the construction of a comprehensive transportation hub have been commenced. The construction of a “#” shaped traffic transportation network is being accelerated. In addition to the overlapping of Shanghai-Kunming and Beijing-Guangzhou high-speed rails (HSR), Changsha plans to complete the construction of Changde-Yiyang-Changsha HSR in 2022. The construction of Changsha-Ganzhou HSR is about to begin, which will advance the construction of a star shaped HSR network. [\(Relevant Link\)](#)

February 9, 2022, the construction of Xi’an East Station Transportation Hub - the first high-speed rail project in the eastern core area of Xi’an - was officially commenced. The project includes the construction of stations on Metro Line 5, except Yuedengge Station, as well as the Xi’an East Station Transportation Hub. As a key railway hub of Xi’an, the Xi’an East Station is a large-scale transportation hub that integrates high-speed rail, ordinary rail, intercity rail, subway, and bus. [\(Relevant Link\)](#)

On February 24, 2022, the Beijing Municipal Administration Center Railway Station Comprehensive Transportation Hub entered the main structure construction phase. The hub is located in the core area of Beijing Municipal Administration Center with a total land area of around 59 ha and is expected to be completed by

the end of 2024. The construction works cover stations on the Beijing–Tangshan Intercity Railway and the Capital Airport—Daxing Airport Intercity Railway, as well as all facilities including stations, public service areas, and municipal supporting facilities along the Pinggu Line and M101 Line. The construction of the Municipal Administration Center enables the rapid connection to the central city area through Line 6 and Pinggu Line. In addition, the commercial-use superstructure of the station will create over 40,000 new jobs. The intercity railway will efficiently connect the Beijing-Tianjin-Hebei region, providing modern transit for integrated development. [\(Relevant Link\)](#)

### **Integrated Development of TOD Towns**

On March 2, 2022, the land lot for TOD on Jurong North Road, Yunjin East Area, Shunde District was sold through online listing. China Resources Land won the construction project of the largest residential, commercial, cultural, and sports complex in Guangdong Province for the year. The TOD project in Yunjin East Area gathers high-quality commercial, educational, and cultural resources. This 24.8 ha plot is located above Jurong North Road Station of Foshan Metro Line 3, with Shunfeng Mountain Park, Yunjin East Area Binhe Park, Shunde No. 1 Middle School, Shunfeng Primary and Secondary School, and Shunfeng Kindergarten in the surrounding area. [\(Relevant Link\)](#)

## “Property over Rail” Projects

On December 30, 2021, the primary structure of Building No. 2, which the supporting project of Huarong Road Station (Xiamen Rail Transit Line 3), was completed. Featuring a total land area of 2.1 ha and a gross floor area of 86,000 m<sup>2</sup>, the project is part of the urban regeneration of Huli District. This project consists of three public housing buildings and 3 buildings for supporting facilities. The project will provide 1368 units of public housing. [\(Relevant Link\)](#)

On February 25, 2022, an urban art park and greenway will be created above Wuqing Depot in

Chengdu. This Park will be the first art park built above a subway station in Chengdu. [\(Relevant Link\)](#)

On March 4, 2022, Eastday reported that after the Shanghai Xinzhuang Station Superstructure Comprehensive Development Project is completed, it would utilize the unused land around Xinzhuang Station on Line 1 and unlock greater commercial and public transit value. The construction of the rail platform area will start in June of this year. The construction of the north-south passage of Xinzhuang Metro Station will continue. [\(Relevant Link\)](#)

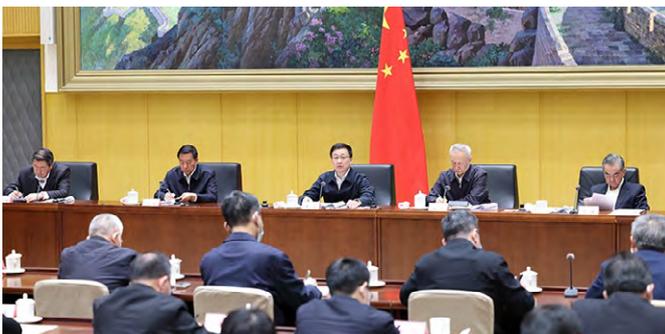
## POLICY UPDATES

On January 13, 2022, the 12th Hunan Provincial Party Congress proposed to implement a strategy to enhance the governance strength of the provincial capital. In addition to building a national-level integrated transportation hub, the Party Congress also proposed to enhance Hunan’s urban functions, further integrate the national railway, rail transit, and ground transit networks. The Party Congress expressed that Hunan should improve the service quality of public transportation by expanding connections between existing bus lines and subways, thereby creating a model city for public transportation. [\(Relevant Link\)](#)

On January 25, 2022, the first meeting of the 13th Guiyang Municipal Committee of the Chinese People's Political Consultative Conference (CPPCC) took place at the Guiyang Conference Center. At the meeting, Liu Yunbo, Member of the

Guiyang CPPCC, expressed that the municipal party committee and municipal government should make full use of the city’s location advantages to promote transit-oriented development. To achieve their goals, the municipal party committee and municipal government should, 1) through coordinating territorial spatial planning, industrial development planning, and other strategic planning to define the functional positions of urban areas where stations are located; 2) accelerate the construction of supporting facilities, such as bus terminus, parking lots for non-motorized vehicles, and Park and Ride. Urban stations should be built close to entrances and exits of Guiyang City Ring Express Rail stations to realize the seamless connection between supporting facilities and Guiyang City Ring Express Rail stations; and 3) promote an integrated ticketing service to facilitate mass transit. [\(Relevant Link\)](#)

On February 10, 2022, the Ministry of Transport (MOT) held the first meeting of the Dual Carbon Goals Leading Group to make working arrangements for the green and low-carbon development of transportation. Group Leader and Minister of Transportation Li Xiaopeng emphasized that as transportation is one of the dominant sources of carbon emissions, every effort must be made to reach the "dual carbon" goal by promoting green and low-carbon transformation and optimizing the transportation structure. The construction of an integrated three-dimensional transportation network and the development of multi-mode transportation with railways and waterways serving as the backbone should be accelerated. Relevant practitioners and authorities should facilitate the integrated development of new technologies and transportation modes. They should also drive the transit-oriented urban development, enhance the capacity of public transit, promote green transit, and encourage the public to choose green transportation modes. [\(Relevant Link\)](#)



(Image Source: Xinhua News Agency)

From March 5-10, 2022, the National People's Congress of the People's Republic of China (NPC) and Chinese People's Political Consultative Conference (CPPCC) were held in Beijing. During the "Two Sessions," a number of NPC deputies and CPPCC members outlined suggestions for China's urban rail transit development. These opinions include the realization of integrated rail transit services in the Greater Bay Area and the

formulation of new infrastructure construction guidelines for the integrated development of high-speed rails, heavy haul rails, standard speed rails, intercity rails, inter-provincial rails, and urban rail transit. [\(Relevant Link\)](#)

## "14th Five-Year Plan" – Transportation Plans

On January 5, 2022, the General Office of the Heilongjiang Provincial People's Government issued the "14th Five-Year Plan for Comprehensive Transit Development of Heilongjiang" (hereinafter the "Plan"). The Plan outlines that during the period of the 14th Five-Year Plan, the transportation system of Heilongjiang will develop a transit system that connects the north and the south of China. Heilongjiang also aims to become an international transport hub for countries in Northeast Asia. The Plan aims to connect all prefectures and cities (Heihe and Jiagedaqi are not included) in the province by intercity or high-speed rail by 2025. In terms of road infrastructure, 85% of counties and cities with a population over 100,000 will be connected via expressways. National highways will reach Tier 2 or higher standard. The Plan also proposes that relevant authorities should improve the quality of roads in townships, high-population unincorporated villages, and incorporated villages.

[\(Relevant Link\)](#)

On January 18, 2022, the State Council issued the "14th Five-Year Plan for the Comprehensive Development of a Modern Transportation System" (hereinafter the "Plan"). The Plan outlines the goal of comprehensively developing an integrated transportation system by 2025. The Plan stipulates that by 2035, a modern and high-quality national comprehensive three-dimensional transportation network will be basically completed. A "National

1 + 2 + 3 Transit Circle”<sup>1</sup> and “Global 1 + 2 + 3 Express Freight Transport Circle”<sup>2</sup> will be basically formed. The vision of this Plan is that China will be a country with strong transportation network by 2025. ([Relevant Link](#))

On January 26, 2022, Tianjin Municipal People's Government issued the "[Implementation Plan for the 'Planning Outline of National Comprehensive Three-Dimensional Transportation Network'](#)" (hereinafter the “Implementation Plan”). The Implementation Plan comprises of five chapters. One of the chapter mentions the construction of main lines of the comprehensive three-dimensional transportation network and the layouts of major transportation hubs, as well as the tasks for driving smart, green, safe, and high-quality development of transportation. ([Relevant Link](#))

On January 26, 2022, Chongqing Municipal Housing and Urban-Rural Development Commission issued the “[14th Five-Year Plan for Urban Rail Transit Construction in Chongqing \(2021-2025\)](#)” (hereinafter the “Plan”). This Plan outlines that during the period of the 14th Five-Year Plan, Chongqing will develop a 600 km rail transit operation network, strive to achieve a total rail length of 1,000 km, and construct urban rail express lines in Chongqing. Low-carbon rail transit should be the primary transportation choice of the public. By 2025, Chongqing’s rail transit should achieve an average daily passenger flow of over 6 million, accounting for at least 30% of motorized travel and over 50% of public transit. By 2035, Chongqing should complete the development of “one network, multiple modes, and full-coverage” rail transit system in the main metropolitan area. ([Relevant Link](#))

On February 14, 2022, Ministry of Transportation, National Railway Administration, Civil Aviation Administration of China, State Post Bureau, and China Railway jointly issued the “[14th Five-Year Plan for the Development of a Modern Comprehensive Transportation Hub System](#)” (hereinafter the “Hub Plan”). It is the first five-year plan to implement the task of constructing a multi-level and integrated comprehensive transportation hub system. The Hub Plan outlines that by 2025, distance between newly constructed transport hubs will be less than 300 meters. Over 90% of transportation hubs can reach city centers within 30 minutes. Integrated cargo hubs should further increase their efficiency in the multimodal transport. More specifically, they are expected to reach over a 90% completion rate of exchanges within 1 hour in newly constructed multimodal transportation hubs. By 2025, over 80% of rail transit can access to airport hubs, while over 90% of the rail transit can access to major coastal ports. ([Relevant Link](#))

On February 23, 2022, Shenzhen Municipal Transportation Bureau officially issued the “[14th Five-Year Plan for Comprehensive Transportation in Shenzhen](#)” (hereinafter the “Plan”). The Plan outlines that, guided by TOD principles, the integrated land development management system for rail stations should be improved, and that overall development intensity should be strengthened. Rail stations' functionalities should further coordinate. The Plan also emphasizes that there should be an increase in the construction of subway superstructures and public housing in surrounding areas, and the connection between public housing projects and rail stations should be strengthened. The Plan proposes that relevant

<sup>1</sup> 1-hour commute time in metropolitan areas, 2-hour travel time between urban clusters, and 3-hour travel time between major cities across the country.

<sup>2</sup> 1 day for domestic delivery, 2 days for neighboring countries, and 3 days to major global cities.

authorities should explore and introduce private funds and other market entities for joint construction and development of integrated transportation hubs and urban rail transit hubs. This is to assist in the sustainable development of rail transit, and further integrate transit hubs and cities. The Plan focuses on driving the integrated development of stations, industries, and cities. ([Relevant Link](#))

On March 3, 2022, at a press conference on the key infrastructure development plans of Beijing during the period of the 14th Five-Year Plan, Lai Xianyu, Deputy Director of the Beijing Municipal Commission of Development and Reform, expressed that during the period of the 14th Five-Year Plan, the rail transit development of Beijing would be carried out in accordance with the needs of building “four centers.” To construct Beijing on the Rail, relevant practitioners and authorities should facilitate transit-oriented development to guide and optimize urban spatial structures and functional layouts. Lai Xianyu expressed that the integration of rail transit and urban functions should be furthered. Urban functional layouts should be optimized around rail networks. Furthermore, Urban resources should be aggregated around stations to turn these stations into micro-centers. ([Relevant Link](#))



(Image Source: Sohu)

## Rail Transit Development

On December 27, 2021, the National Development and Reform Commission (NDRC) issued the

“Multi-Level Rail Transit Plan for Chengdu-Chongqing Economic Circle” (hereinafter the “Plan”). This is the second regional multi-level rail transit plan initiated at the national level. The issuance and implementation of the Plan will facilitate the comprehensive and high-quality development of the Chengdu-Chongqing Economic Circle and accelerate the development of Chengdu-Chongqing on the Rail.

([Relevant Link](#))

On March 17, 2022, the "Special Plan for the Comprehensive Utilization of Rail Transit in Hangzhou" (hereinafter the “Plan”), drafted with the assistance from Hangzhou City Planning and Design Academy, was approved by the Hangzhou Municipal People's Government. The Plan is the first plan for utilization of rail transit in the city approved at the municipal level in China. The primary goal of the Plan is to develop Hangzhou through utilizing the advantages of rail transit.

([Relevant Link](#))

## Urban-Rural Planning and Development

On February 11, 2022, the General Office of the Beijing Municipal People's Government issued the “Implementation Plan for Facilitating High-Quality Development of Beijing Sub-Center” (hereinafter the “Plan”). The Plan outlines that Beijing will drive the integration of the municipal administration center, Tongzhou District, Sanhe City, Dachang Hui Autonomous County, and Xianghe County (hereinafter the “Northern Counties”) of Hebei Province and create a high-quality sub-center to ease the pressure of Beijing. This area is also expected to be developed into a national level demonstration zone of green development. The Plan also proposes that a number of rail transit lines, such as Line 22 (Pinggu Line) and the

Beijing–Tangshan Intercity Railway, will soon put into operation. The construction of cross-regional roads, such as Changtong Road, Yaojiayuan Road East Extension, Shixiao Road, and Tongbao Road, should be facilitated. To improve the efficiency of traveling to and from Beijing, the Plan also calls for the optimization of bus routes to and from the Northern Counties, a joint construction of bus rapid transit (BRT) corridors, an optimization of checkpoints, and completion of bus-only passages at the Baimiao and Xinggezhuang checkpoints.

*(Relevant Link)*

## **Territorial Spatial Planning**

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On December 30, 2021, the Ministry of Natural Resources and the Standardization Administration jointly issued the “Three-Year Action Plan for the Formation of a Technical Standard System for Territorial Spatial Planning (2021-2023)” (hereinafter the “Action Plan”). The Action Plan aims to establish a multi-level, integrated, and scientifically applicable technical standard system for territorial spatial planning by 2023. Standards for more than 30 items will be formulated and reviewed. They will cover the preparation, approval, implementation, technology, methods, management, and information platforms of territorial spatial planning. *(Relevant Link)*

# TOD and Low-Carbon City



# 1. BACKGROUND

Since Peter Calthorpe introduced transit-oriented development (TOD) in his book *The Next American Metropolis* in 1993, the concept has been continuously enriched through practice for nearly 30 years. The original TOD concept expressed Calthorpe's vision of a beautiful community with convenient transit access, affordable housing, and public amenities. Subsequently, in response to the automobile-dominated spatial form of American cities, the concept of TOD has been expanded to focus on reshaping the relationship between rail transit and the real estate market, integrating transportation and land use planning, and creating more diverse, denser, and mixed-use neighborhoods and cities. Facing the challenges of global climate change, practitioners and residents alike have higher expectations for TOD in terms of low-carbon development and greenhouse gas emissions mitigation.

Within city limits are many energy-consuming and CO<sub>2</sub>-emitting activities, such as industrial production, building construction, transportation, and office and residential heating. Data from the International Energy Agency (IEA) shows that the reduction of carbon emissions from transit is key to addressing global climate change and reducing greenhouse gas emissions. Annual global CO<sub>2</sub> emissions have reached 31.5 billion tons in 2020, and despite the movement of people and global supply chains being negatively affected by the COVID-19 pandemic, transportation sector still contributes 7.2 billion tons to global CO<sub>2</sub> emissions, accounting for 24%<sup>3</sup> of total emissions. The largest source of carbon emissions in the transportation sector is passenger cars, accounting for 41% of total sector emissions. By comparison, public transit such as buses and rail accounts for only 10%<sup>4</sup>. As such, the transportation sector has great potential to reduce carbon emissions by promoting the use of walking, cycling, and public transit.

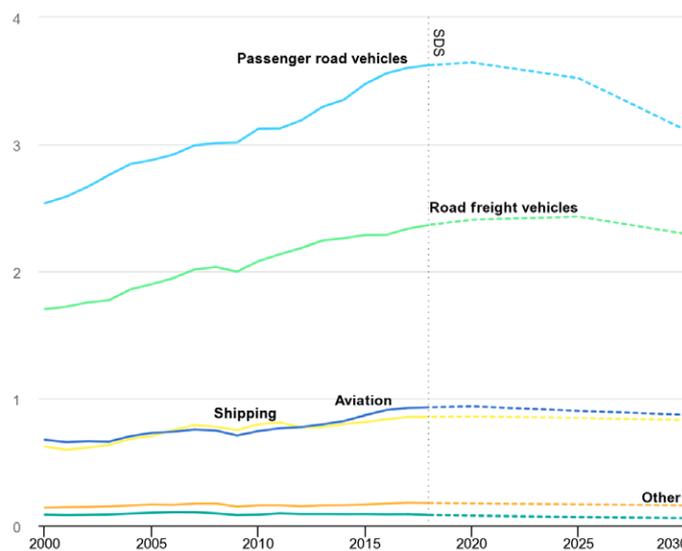


Figure 1. Transport sector CO<sub>2</sub> emissions by mode, 2000-2030  
Source: International Energy Agency<sup>5</sup>

<sup>3</sup> IEA. (2021). *Global Energy Review: CO<sub>2</sub> Emissions in 2020*. IEA, Paris.

<sup>4</sup> Tiseo, I. (2021, Dec. 14). *Breakdown of CO<sub>2</sub> emissions in the transportation sector worldwide 2020, by subsector*. Statista.

<sup>5</sup> IEA. (2021). *Transport sector CO<sub>2</sub> emissions by mode in the Sustainable Development Scenario, 2000-2030*. IEA, Paris.

## 2. THE RELATIONSHIP BETWEEN TOD AND CARBON EMISSIONS FROM TRANSPORT

Revolving around public transit, TOD provides many opportunities for the reduction of carbon emissions in the transportation sector. According to the American Public Transportation Association (APTA), TOD strategies have two primary mechanisms for reducing carbon emissions<sup>6</sup>. The first is the improvement of transit efficiency. Large public transit hubs such as subways, light rail, and rapid transit can carry 5 to 20 times more passengers per hour than that of cars. Decreasing the proportion of private car trips and increasing the ridership of transit can effectively reduce carbon emissions. The second is that TOD can guide the transformation of cities towards more compact forms that are more suitable for walking and cycling, reduce the distance of a single trip, decrease the ownership of private vehicles, and prevent low-density urban sprawl<sup>7</sup>.

City	Transport CO2 Emission Reduction Strategy	Expected Targets
Atlanta	2015 Climate Action Plan: Increase the number of residents within a 10-minute walking distance of rail stations from 70,000 to 500,000; build 900 miles of sidewalks and reduce block sizes by 25%; and concentrate new residential projects within 20-minute commute of employment centers	Reduce carbon emissions in the transportation sector by 20% by 2020 (compared to 2009)
Boston	2014 Climate Action Plan: Improve public transit coverage; and expand cycling and pedestrian infrastructure	Reduce vehicle mileage by 5.5% by 2020 (compared to 2005)
Chicago	2008 Climate Action Plan: Through mixed land utilization and compact urban development, increase daily walking and cycling trips to 1 million and rail transit passenger volume by 30%	Reduce carbon emissions in the transportation sector by 3.5% by 2020 (compared to 2005), totaling 1.25 million tons
Cleveland	2013 Climate Action Plan: Increase population density from 4,800 to 6,000 people per square mile by 2030 and reduce the proportion of solo car trips from 69% (2010) to 55%	Reduce carbon emissions in the transportation sector by 96,000 tons by 2030 (compared to 2010)
Denver	2015 Climate Action Plan: Promote TOD, vehicle sharing, and enhance bus transit options	Reduce carbon emissions in the transportation sector by 100,000 tons by 2020 (compared to 2005)
Los Angeles	2016 Regional Transportation Plan: Direct new population growth towards rail stations and corridors, improve TOD implementation, and expand in-region rail services	Reduce total regional emissions by 2% by 2020
Miami	GreenPrint 2010: Facilitate the integration of land utilization and transit planning at the corridor level and increase rail transit passenger volume and pedestrian activity	
Philadelphia	Connections 2040: Construct a more balanced transit system revolving around the city center	Reduce carbon emissions from transit sources by 80% by 2050
Seattle	2013 Climate Action Plan: Ensure that at least 45% of population growth and 85% of job growth in the future will take place in existing urban core areas and continue to expand rail transit services and pedestrian infrastructure	Reduce carbon emissions from vehicle-related sources by 82% by 2030 (compared to 2008)

**Table 1. Summary of proposed travel reduction and residential energy conservation strategies and targets for selected U.S. cities**  
Source: Landis et al., 2017

<sup>6</sup> APTA. (2009, Aug. 14). Quantifying Greenhouse Gas Emissions from Transit. APTA Recommended Practice.

<sup>7</sup> Improving the energy efficiency of public transit systems and reducing the carbon emissions of infrastructure are beyond the scope of this issue. For relevant information, refer to the “LEED Rating System for Public Transit Infrastructure” section in Issue 12 of the GEF6 China SCIAP.

Over the past decade, different types of cities in the U.S. have begun to apply TOD principles as part of their transport emission reduction strategies with the hope that by changing the modal options of residents, population and employment opportunities can be directed to public transit stations and corridors, and pedestrian and cycling infrastructure can be expanded. Ultimately, vehicle miles traveled (VMT) could be reduced within city limits. But these cities found that TOD practices cannot always reduce carbon emissions as expected, as different influencing factors like land and socioeconomic conditions will complicate the efforts (Landis et al., 2017). In Atlanta, Miami, and Phoenix, where the densities of urban cores are lower, increasing population density does not necessarily lead to increased pedestrian activity or higher transit ridership. On the other hand, cities like Chicago, Boston, and Philadelphia have higher land use intensity in downtown areas and low population growth rates at the same time, resulting in stagnant demands for transit systems and less incentives for investment. Rail transit that cannot increase ridership is unable to effectively reduce costs and consequently produce more emissions per passenger trip in the carbon accounting of the infrastructure's entire lifecycle. More importantly, if a city cannot improve the comfort and convenience of walking and cycling in city blocks, the application of TOD will prove ineffective to reduce VMT and the corresponding carbon emissions.

### 3. OPPORTUNITIES AND CHALLENGES FOR REDUCING CARBON EMISSIONS THROUGH TOD IN CHINESE CITIES

Reducing CO<sub>2</sub> through TOD strategies presents both opportunities and challenges for Chinese cities. The opportunities lie in the fact that, unlike American cities which have been in relatively stable forms, most Chinese cities are still in the stage of rapid development. Urbanization rate in China is expected to reach 80% by 2050, with more than 250 million people migrating to seek job opportunities and settle in cities in the next thirty years. The urbanization process is accompanied by a substantial increase in the demand for transportation. When compared with automobiles, public transit offers higher passenger capacity, lower marginal costs, and reduced carbon emissions.

The challenges of reducing emissions through TOD strategies are also evident. China's diverse topography, widely different socio-economic conditions, and diverging trends of population growth in expanding and shrinking cities are all influencing factors that should be considered at the planning stage. City leaders and planners need to be aware of such nuances when working towards the “dual carbon” goals to peak carbon emissions by 2030 and achieve carbon neutrality by 2060.

#### **Emission Pathways and Rail Transit Construction in TOD Project Cities**

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Participating cities of the GEF6 China Sustainable Cities Integrated Approach Pilot Project (GEF6 SCIAP) include Beijing, Tianjin, Shijiazhuang, Guiyang, Nanchang, Ningbo, and Shenzhen. These cities differ in population size, fiscal revenue, population density, economic structure, and land use regulations, representing different TOD phases and emission pathways.

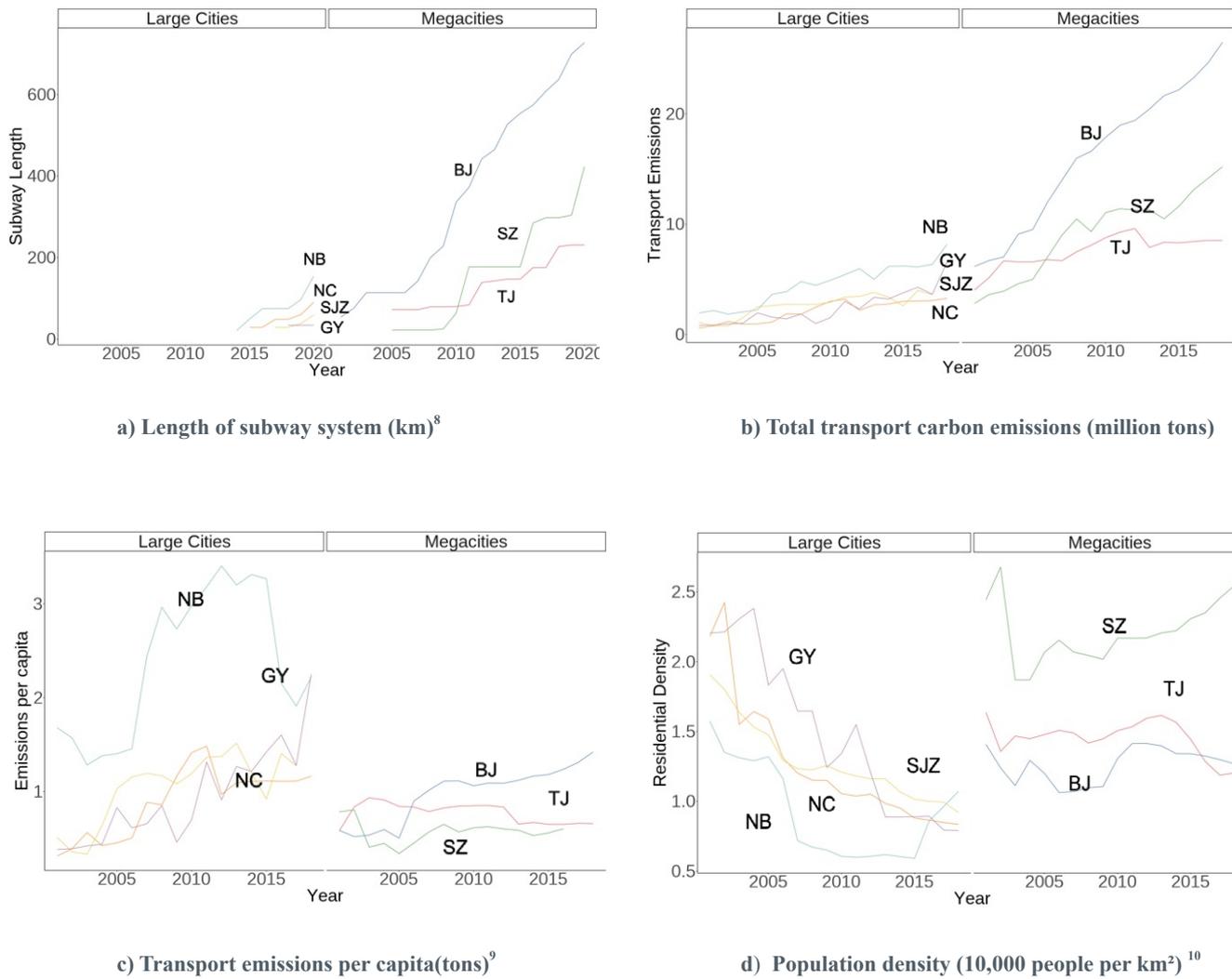


Figure 2. Length of urban subway system, transport carbon emission, and population density of seven project cities (2001-2018)

Note: BJ, TJ, SJZ, NB, NC, GY, SZ stands for Beijing, Tianjin, Shijiazhuang, Ningbo, Nanchang, Guiyang, and Shenzhen, respectively

Data source: China Emission Accounts and Datasets and China Urban Construction Statistical Yearbook. Figures are prepared by the author.

As shown in Figure 2a, for Beijing, Shenzhen, and Tianjin, the megacities with a permanent population of over 10 million, subway systems have increased rapidly in the past two decades. In 2020, Beijing reached 727 km of rail, while Shenzhen reached 422 km, and Tianjin reached 231 km. Subway systems in Shijiazhuang, Guiyang, Ningbo, and Nanchang, the cities with less than 10 million population, have also been steadily increasing since 2014.

<sup>8</sup> Data compiled from public information covering 2001-2020.

<sup>9</sup> Calculated by dividing total emissions from the transportation sector by the urban resident population.

<sup>10</sup> Calculated by dividing the urban resident population by the total urban area.

Ningbo has seen the fastest growth in rail transit among the seven cities as 5 lines and 154 km of subway were put into operation since 2014.

The total transport emissions of the seven project cities, in line with the general trends of subway construction, have continued to increase over the past two decades, albeit with differences in magnitude between megacities and smaller ones (Fig 2b). Transport emissions in Beijing and Shenzhen rose from 6.17 million tons and 2.82 million tons in 2001 to 26.48 million tons and 15.2 million tons in 2018, respectively, representing an increase of over 300%. Shijiazhuang, Guiyang, Nanchang, and Ningbo started low in 2001 with total transport emissions averaging around 1 million tons. But Ningbo and Guiyang’s transport emissions had increased significantly and reached 8.17 million tons and 6.57 million tons in 2018, far higher than the average of cities in similar sizes.

On the contrary, per capita transport emissions were lower in megacities. Per capita transport emissions of Tianjin and Shenzhen stabled around a ton. Transport activities in Shijiazhuang, Guiyang, Nanchang, and Ningbo were less energy efficient as per capita transport emissions increased rapidly since 2001 (Figure 1c). Ningbo and Guiyang had significantly higher per capita CO2 emissions than the other cities, reaching 2 tons in 2018.

What contributed to such differences in the cities’ transport carbon emissions profiles? The first factor is travel behavior. Public transit’s ridership was much higher than trips done by passenger vehicles in Beijing and Shenzhen in 2015. But private vehicles and taxi still dominated in modal choices in Shijiazhuang, Guiyang, Nanchang, and Ningbo, where there were less population and smaller subway networks (Table 2).

City	Urban Population <sup>11</sup>	Bus and Subway <sup>12</sup>	Private Vehicles and Taxi <sup>13</sup>
Beijing	1878	744,671	227,740
Tianjin	1278	187,063	123,799
Shenzhen	1138	349,679	199,361
Shijiazhuang	631	58,686	70,977
Ningbo	547	49,947	83,522
Nanchang	378	58,783	87,914
Guiyang	345	64,486	146,109

**Table 2. Number of trips by transport mode in project cities (2015)**  
Data source: China Academy of Transportation Sciences

<sup>8</sup> Data compiled from China City Construction Statistical Yearbook

<sup>9</sup> Unit is 10 thousand trips

<sup>10</sup> Unit is 10 thousand trips

Residential density is another factor that influences the seven cities' carbon efficiency in transport sector. Denser cities mean shorter residents' commuting distance, concentrated infrastructure investments, and convenient walking and cycling around transit stations. But this is not the case for Shijiazhuang, Guiyang, Nanchang, or Ningbo for now, since their residential densities have been decreasing since 2001 from an average of 18 thousand people per km<sup>2</sup> to less than 10 thousand. Beijing and Tianjin showed a similar downward trend. Their moderate population growth did not match the fast pace of spatial expansion. Only Shenzhen had an increasing urban density after its initial drop before 2005 (Figure 2d).

It should be noted that Table 2 uses cross-sectional data from 2015. During this period, rail transit in Guiyang, Nanchang, Shijiazhuang, and Ningbo was either still under construction or had just started operations, meaning that impacts on travel behaviors and the urban form had yet to materialize. Further studies are required to continuously document changes in residents' travel patterns and explore the relationship between mobility and the built environment.

## 4. CONCLUSION

This article begins with an introduction of how reducing carbon emissions in the transportation sector can address global climate change and discusses the potentials of TOD strategies to reduce emissions from passenger and freight vehicles at city level. Empirical studies show that cities are more likely to reduce transport emissions by increasing ridership of public transit, changing residents' travel behaviors, guiding cities towards more compact forms, and shortening commute distances. Using the transport carbon emission data of Chinese cities from 2001 to 2018, this article has reviewed emission pathways, rail transit development, and urban densities of the seven cities participating in the GEF China Sustainable Cities Integrated Approach Pilot Project. City leaders and planners should pay attention to the diverse socioeconomic factors that might complicate the efforts to pursue a low-carbon urban future.

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## UPCOMING TOD RELATED EVENTS

**Forum on TOD Innovation and Urban Sustainability  
Under the Dual Carbon Goals & Annual Meeting of the TOD  
Committee of CSOTE,**

**April 8-10, 2022**

**Beijing, China**

**Theme: TOD Innovation Drives Sustainable Urban Development**  
*(Relevant Link)*

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