

Transport innovation in Our Country

I. Overview of the transport innovation in our country

- Our country's transportation sector has undergone significant transformations in recent decades. Our country's rapid economic growth and urbanisation have resulted in significant investment in transportation infrastructure and technological advancements.
- The integration of technologies such as 5th-generation mobile communication (5G), the Internet of Things, big data, cloud computing, and artificial intelligence with transportation has deepened. Significant progress has been made in the construction of new infrastructure in the transportation sector. The digitisation rate of transport infrastructure has significantly increased, and substantial breakthroughs have been achieved in data openness, sharing, and platform integration (中國人民共和國中央人民政府, 2022).
- Our country's focus on innovation has positioned it as a global leader in various modes of transportation, including high-speed rail, bus-rapid transit (BRT), electric vehicles, and autonomous vehicles.

II. High-speed rail

- High-speed rail is the passenger train system that operates at 250 km/h (155 mph) or more, providing fast and efficient travel over long distances (International Union of Railways, 2024).



High-speed rail in our country

- Our country has the world's longest high-speed rail networks. The first high-speed rail line, the Qinhuangdao-Shenyang High-Speed Railway (now part of the Beijing-Harbin Railway) was operated with a length of 404 km and a speed of 250 km per hour in 2003, ushering in our country's high-speed rail era.
 - Network size: As of November 30, 2023, China's high-speed rail (HSR) network spanned approximately 43,700 km (Figure 1). It accounts for 28.1% of China's railroad network, which is currently approximately 155,500 km long (statista, 2024).
 - Technological advancements: The Beijing-Tianjin Intercity Railway, which opened in 2008, was our country's first railway designed for speeds of 350 km/h. This was followed

by the opening of the Wuhan-Guangzhou High-Speed Railway in 2009, one of the longest high-speed rail lines in the world.

- **Maglev technology:** The Shanghai Maglev Train, running from Longyang Road Station in Shanghai to Shanghai Pudong International Airport, has a maximum operating speed of 460 km/h. As of June 2023, the Shanghai Maglev Train is the world's fastest commercially operated train ([Railway Technology, 2023](#)).

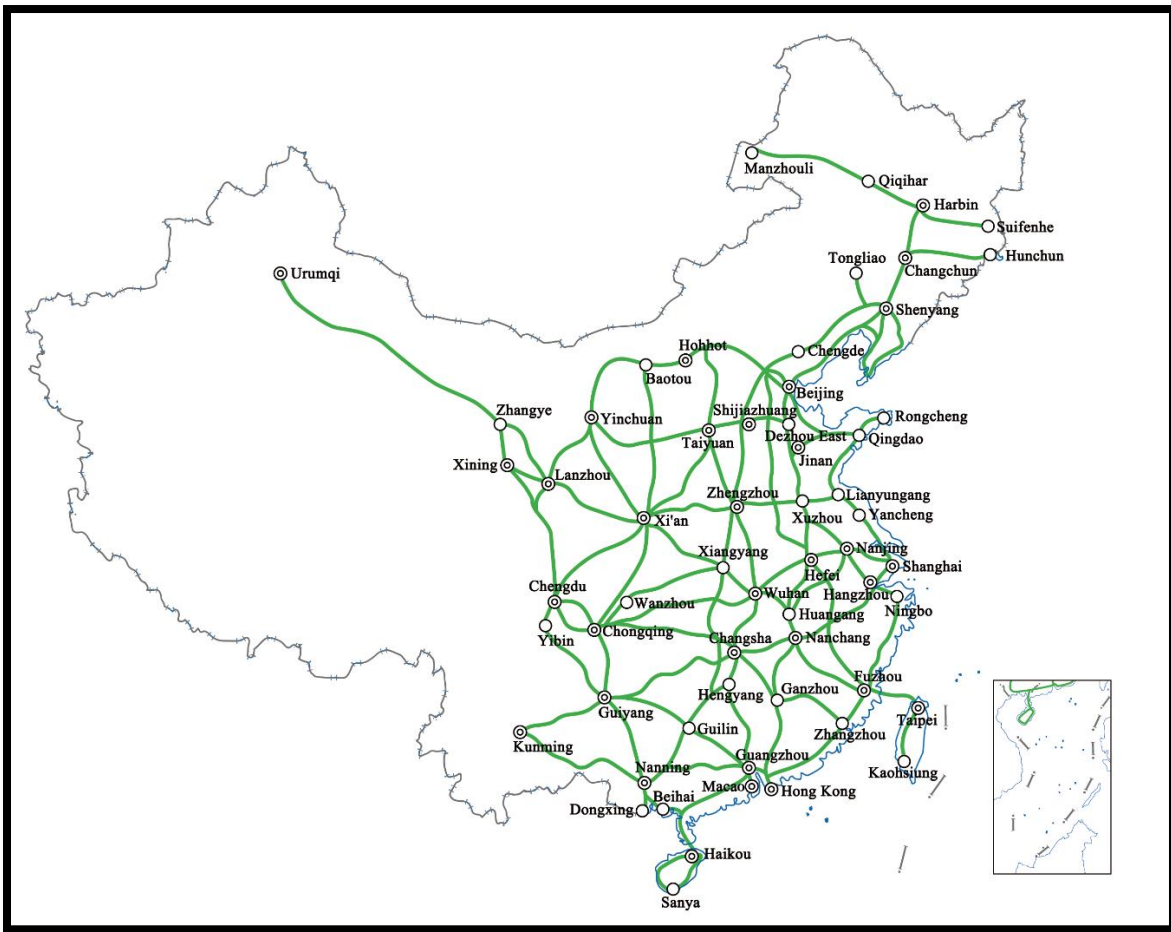


A model of the Shanghai Maglev Train

- The eastern part of our country is the most densely populated and economically developed region, with extensive high-speed rail coverage:
 - **Beijing-Shanghai Corridor:** One of the busiest and most important high-speed rail routes, the Beijing-Shanghai High-Speed Railway covers approximately 1,318 km and connects two major economic hubs.
 - **Yangtze River Delta:** This region includes Shanghai, Hangzhou, Nanjing, and Suzhou, all well-connected by high-speed rail, fostering economic integration and development.
 - **Beijing-Tianjin-Hebei (Jing-Jin-Ji):** The Beijing-Tianjin Intercity Railway, a key route in this city cluster, significantly reduces travel time between the two cities to about 30 minutes.
- The southern part of our country is known for its rapid economic growth and includes several key high-speed rail routes:
 - **Zhujiang Delta:** Cities like Guangzhou, Shenzhen, and Hong Kong are seamlessly connected by high-speed rail, promoting economic collaboration in this densely populated region.
 - **Guangzhou-Shenzhen-Hong Kong Express Rail Link:** This line connects Guangzhou, Shenzhen, and Hong Kong, facilitating cross-border travel and trade.
 - **Coastal High-Speed Rail:** The coastal high-speed rail line connects major cities along the southeastern coast, including Fuzhou, Xiamen, and Shantou, enhancing regional connectivity.
- The central part of our country is experiencing rapid urbanisation and economic growth, supported by extensive high-speed rail coverage.
 - **Wuhan Hub Direct Line:** Wuhan, a central transportation hub, is connected to major cities like Beijing, Guangzhou, and Shanghai through high-speed rail, making it a key node in the national network.

- Zhengzhou: As a major railway junction, Zhengzhou connects the east-west and north-south high-speed rail lines, promoting regional economic development.
- The western part of our country is seeing increased high-speed rail investments to enhance connectivity and economic growth.
 - Chengdu-Chongqing High-Speed Railway: This line connects two major cities in the western part of our country, as an important part of the New Western Land-Sea Corridor and an important passage for our country's southbound trains, fostering regional development and integration.
 - Xi'an Hub: Xi'an serves as a key high-speed rail hub in the western part of our country, connecting to cities like Beijing, Chengdu, and Lanzhou, promoting economic growth in the region.
 - Lanzhou-Urumqi High-Speed Railway: This line extends to the far western regions, connecting the cities of Lanzhou and Urumqi, and promoting development in the west.

Figure 1 China high-speed rail route map 2024



Reference: <https://www.chinadiscovery.com/china-trains/maps/china-train-travel-maps.html>

- High-speed rail is a critical component of our country’s transportation infrastructure, enlarging the transportation circles, driving sustainable growth, and reducing environmental impact (GIZ, 2022):
 - Improved accessibility: High-speed rail significantly reduces travel time, enhancing intra-city and inter-city connectivity and mobility (Table 2).
 - Economic growth: It stimulates regional economic development, increases employment, and boosts tourism.
 - Environmental impact: High-speed rail offers a low-carbon alternative to air travel, contributing to CO₂ reduction. It is more energy-efficient compared to other transportation modes.
 - Market shift: The expansion of high-speed rail leads to a substantial reduction in short-haul flights, as passengers prefer the convenience and speed of high-speed rail.
 - Urban development: It influences urban planning, leading to the development of new urban areas around stations.

Table 2 High-speed rail and transportation circle

Transit circle	The impact brought by the high-speed rail on population mobility
0.5 hour	Increase the number of regions accessible within a 30-minute travel time, improving urban connectivity.
2 hours	High-speed rail travels at ~300 km per hour, allowing for a 2-hour journey between major cities.
1 day	Travelling between cities in a single day is possible, allowing for greater intercity population mobility.

III. Bus-rapid transit (BRT)

- Our country continues to expand its BRT systems to enhance urban transportation. Cities have been integrating smart technology and improving connectivity with other transport modes to increase efficiency and reduce congestion. These initiatives are part of a broader effort to accommodate growing urban populations and promote sustainable transport solutions ([Institute for Transportation and Development Policy, 2024](#)).
 - Guangzhou: Guangzhou has continued to enhance its BRT system by integrating advanced technologies for better efficiency and passenger experience. The city focuses on improving connectivity with metro lines and other public transport options.



BRT system in Guangzhou

- Beijing: Beijing has expanded its BRT network to reduce congestion and improve urban mobility. New routes and upgraded facilities have been implemented to accommodate increasing passenger demand.
- Chengdu: Chengdu is developing its BRT system with an emphasis on sustainability and reducing carbon emissions. The city is incorporating electric buses and smart traffic management systems.

IV. Electric vehicles

- Our country is the world's largest market for electric vehicles (as of 2022), driven by significant government support, technological advancements, and consumer demand. Electric vehicles integrate advanced technologies such as new energy sources, materials, and artificial intelligence, transforming them into smart, connected devices.
- Our country's focus on reducing greenhouse gas emissions and air pollution has catalysed the rapid development and adoption of electric vehicles.
 - Market leadership: China accounted for nearly 60% of new electric car registrations worldwide (as of 2022). For the first time in 2022, China accounted for more than half of electric vehicles on the road, totalling 13.8 million ([International Energy Agency, 2023](#)).
 - Battery technology: Chinese companies like CATL and BYD are leaders in lithium-ion battery production, contributing to advancements in energy density and cost reduction ([California Management Review, 2024](#)).
 - Policy support: Government initiatives, such as subsidies, tax incentives, and the construction of extensive charging infrastructure, have accelerated electric vehicle adoption ([中國人民共和國中央人民政府, 2020](#)).
 - Development goals: By 2025, our country aims to achieve major advancements in battery technology and vehicle safety, and integrate electric vehicles with renewable energy resources and smart city infrastructure to improve efficiency and sustainability across the transportation sector. The market share of electric vehicles is expected to increase to 20% of new car sales ([中國人民共和國中央人民政府, 2020](#)).

V. Autonomous vehicles 自動駕駛汽車

- Our country is rapidly becoming a global leader in the development and deployment of autonomous vehicles. Driven by significant government support, technological advancements, and strong market interest, our country's autonomous vehicle industry is poised to revolutionise the transportation landscape, offering enhanced safety, efficiency, and new mobility solutions.
 - Testing and deployment: Major cities like Beijing, Shanghai, and Shenzhen have designated areas for autonomous vehicle testing. Companies like Baidu, Pony.ai, and AutoX are leading trials.
 - Regulatory framework: Our country's government has issued guidelines to facilitate the development and deployment of autonomous vehicle technology, aiming to commercialise autonomous driving by 2025 ([中國人民共和國中央人民政府, 2020](#)).



Autonomous vehicles

VI. Conclusion

- Our country’s transportation sector has witnessed remarkable innovations across various modes, driven by substantial investments, government support, and technological advancements. As our country continues to urbanise and grow economically, ongoing innovation in transportation will be pivotal in addressing emerging challenges and ensuring sustainable development.

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