The Impact of Urban Integrated Transportation Planning Policy on Economic Development Based on Big Data

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Abstract. With the accelerating process of urbanization, the scale of Chinese cities is larger and larger, the population capacity is more and more, the process of urban economic development is more and more rapid, and the comprehensive transportation system of cities is further expanded. Based on the availability of big data, this paper takes Chengdu City, Sichuan Province, as an example, to explore the impact of rail transit on promoting urban economic development under urban comprehensive transportation. Through the comparison of the land supply area and housing price data of the regions along the rail transit station and the non-regions along the rail transit station, it is found that the developed urban transportation can enhance the open development of the urban economy, optimize the investment environment and provide the investment market. Convenient and superior transportation conditions can accelerate the economic cycle within the city, meet people's requirements for high quality living standards, and promote the establishment and development of a harmonious society.

Keywords: Rail transit planning, high-speed rail, metro, economic development.

1. Introduction

Recently, the Ministry of Housing and Urban-Rural Development issued the "Guiding Opinions on Comprehensively Promoting the Construction of Urban Comprehensive Transportation System" (hereinafter referred to as the "Guiding Opinions"), and proposed that by 2025, the comprehensive transportation system of various cities will be further improved, the layout of facilities and networks will be more perfect, and the operating efficiency, overall benefits and the level of intensification, intelligence and green will be significantly improved; By 2035, a comprehensive modern urban transportation system that is fully functional, efficient, intelligent, green, safe and resilient will be basically established in all localities [1]. This paper selects areas along and non-along rail transit in Chengdu, Sichuan Province, and investigates citizens' daily transportation modes and trips through big data. Taking areas along and non-along Chengdu East Passenger Station and metro lines as typical, this paper discusses the impact of urban rail transit planning policies on economic development: The network and in-depth development of urban rail transit can effectively promote the development of urban economy. Specifically, it is reflected in the improvement of per capita GDP, the increase of urban population, the increase of urbanization level, the development of secondary and tertiary industries, and the improvement of overall urban GDP.

2. Policy Background

According to China's Ministry of Transport, by the end of 2023, 55 cities had opened 306 rail transit lines, with an operating mileage of 10,165.7 kilometers and 5,897 stations. The four major municipalities directly under the Central Government, the capital cities of 23 provinces (autonomous regions), and the five separately planned cities have all achieved rail transit coverage [2]. Although the construction of rail transit lines requires a large amount of capital investment, the benefits it brings are very considerable in both economic and environmental aspects. On the one hand, with the goal of reducing vehicle-related air pollution and traffic congestion, reducing travel time, reducing travel difficulty, and expanding public transport network can make commuters switch from driving private vehicles to public transport, which can potentially reduce traffic congestion and vehicle emissions. In

literature, the impact of the opening of the first subway line in Changsha, China on air quality was estimated by DID method, and it was found that the amount of carbon dioxide in the area near the subway station was reduced by 18% [3]. On the other hand, rail transit facilitates the travel needs of residents and saves commuting time, which leads to an increase in the occupancy rate near the traffic stations and along the subway lines, more abundant urban construction, and more perfect infrastructure configuration of the living circle. Rail transit has improved the overall public service level of the city, strengthened the siphon effect of the city, attracted more people and enterprises to flood into the city, and strengthened the spatial connectivity within the region, bringing the growth of urban economic benefits.

Studies have shown that the opening of rail transit can increase urban GDP growth by 1.08-1.37%. In addition, every 10% increase in the density of urban subway stations contributes 0.054 percentage points to the GDP growth of the year [4]. While promoting economic growth, the opening of rail transit such as subway also has positive benefits for employment and industrial development. Quick access to destinations via rail transit allows businesses in central urban areas to employ workers from the city periphery on a large scale. At the same time, it can attract enterprises in the secondary industry and the tertiary industry to land near the site and increase the city's GDP.

3. Data Analysis

3.1. High-Speed Rail Stations Along and Off-Line Areas

Chengdu East Railway Station is in Chenghua District, Chengdu City, Sichuan Province, China. It is a comprehensive transportation hub integrating various modes of transportation such as general speed, high-speed rail, subway and automobile. It is one of the largest railway passenger stations in central and western China and one of the "three main and three auxiliary" passenger stations in Chengdu railway hub planning. This study selects Chengdu East Railway Station to analyze the nearby land supply area and housing price.

3.1.1. Land supply area

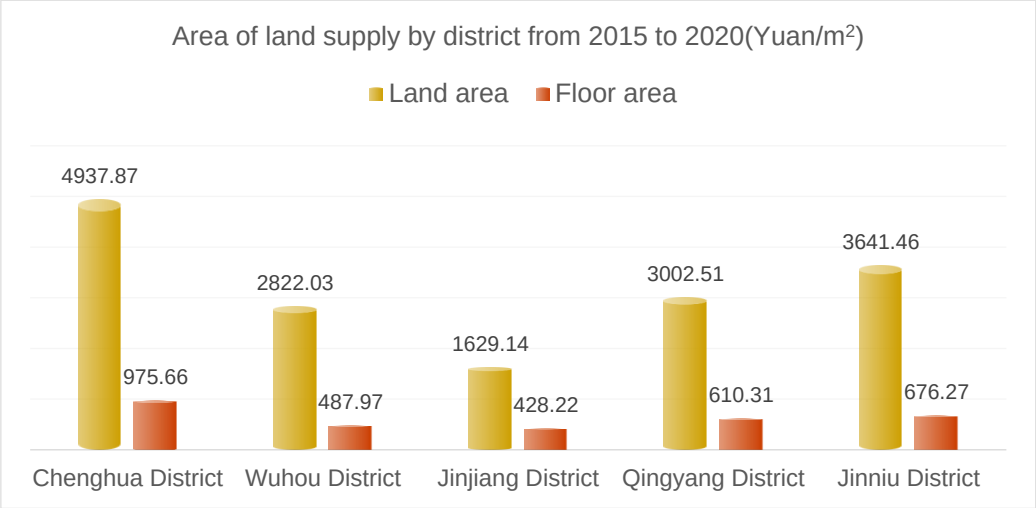


Figure 1. Area of land supply by district from 2015 to 2020

As can be seen from Fig. 1, the land area and construction area used for real estate and enterprise construction in Chenghua District in the past five years are in a leading position compared with other districts with better development, and the development of Chenghua District has been accelerated thanks to the radiation of passenger flow from Chengdu East Railway Station. In the past five years, through real estate development investment, Chenghua District has welcomed nearly 40 real estate development enterprises, including Evergrande, Shougang, Zhongliang, Poly, Vanke, Aoyuan and many other brand housing enterprises. With the urban development, more and more developers will

pay attention to the potential value of Chenghua District. Under the new urban opportunities, Chenghua District will release its vigorous vitality and regional charm in the future.

3.1.2. Room rate

Table 1. Housing price data of Chengdu East Railway Station and Chengdu

Month	Chengdu East Railway Station (Yuan/m2)	Chengdu(Yuan/m2)
May	29666	16224
June	29500	16600
July	29500	16648
August	29500	16629
September	29500	16791
October	30000	16290
November	30000	16220
December	30000	16644
January	30000	16691
February	30000	16500
March	30000	16663
April	30000	16973

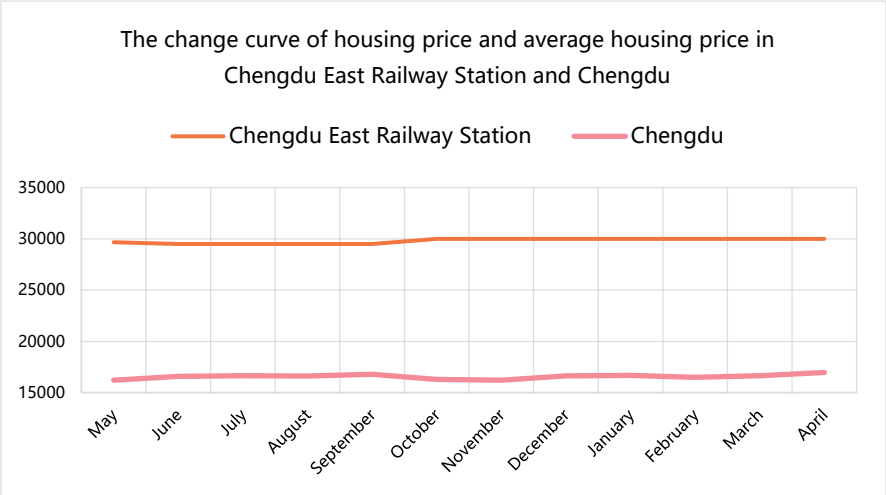


Figure 2. Comparison of housing price in Chengdu East Railway Station and Chengdu

Thanks to the beneficial geographical location of Chengdu East Railway Station and its close connection with subway tracks, it can be seen from Table 1 that the overall housing price of Chengdu East Railway Station in the past year is higher than the average housing price of Chengdu and tends to be twice. It can be seen from Fig. 2 that the housing price of Chengdu East Railway Station and Chengdu has shown an overall upward trend in the past year. The convenience of high-speed railway attracts more and more people to settle here. In the future, the housing price of Chengdu East Railway Station may be in an upward trend, which will drive the urban economic development.

3.1.3. The benefit of high-speed rail to the economic development of Chengdu.

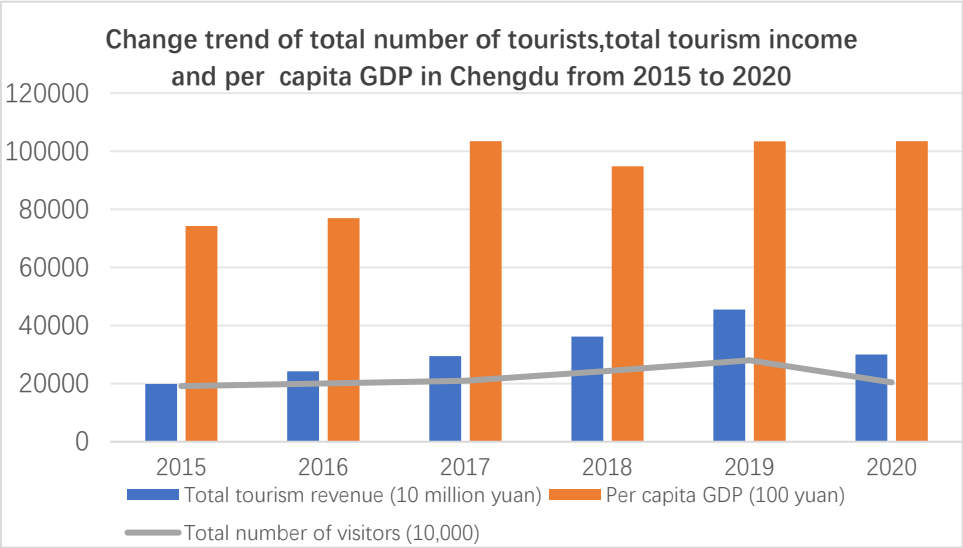


Figure 3. Change trend of total number of tourists, total tourism income and per capita GDP in Chengdu from 2015 to 2020

It can be seen from Fig. 3 that the overall change trend of total number of tourists, total tourism income and per capita GDP in Chengdu in recent five years is on the rise. The construction of high-speed rail has extraordinary significance for a city. The Chengdu Manufacturing 2025 Plan proposes a development pattern of "multi-point support and multiple support", and the rail transit industry is one of the key development industries [5]. The construction of high-speed railway connects various cities, and the convenient transportation promotes the rapid development of Chengdu's tourism industry, increasing the number of tourists and driving tourism income. At the same time, more outstanding talents can be introduced to settle in Chengdu, making the city's economic income increase. At the same time, the government invests more funds in the construction of high-speed rail, and the field of rail transit construction continues to research and develop new materials, introduce new technologies, and create advanced rail transit equipment, so that the field of rail transit manufacturing is separated from traditional manufacturing, and is transformed into intelligent manufacturing, service-oriented manufacturing and green manufacturing. It can not only reduce the capital consumption of energy materials, but also increase the passenger volume in a cost-effective manner [6].

3.2. Metro Along and Off Line Areas

As of May 2023, Chengdu Metro has opened and operated 13 lines (including 1 tram), including Line 1-10, Line 17, Line 18 and Line 2, with a total operating mileage of 558 kilometers (including 39 kilometers of trams) [7]. Among the lines that have been opened, Chengdu Metro Line 9 is the first fully automated driverless rail transit line in western China, and the first fully automated driverless urban loop line in the world that uses 8A marshalling vehicles. Chengdu Metro Line 18 is the country's first direct metro express line to the central city.

3.2.1. Chengdu Subway operation change

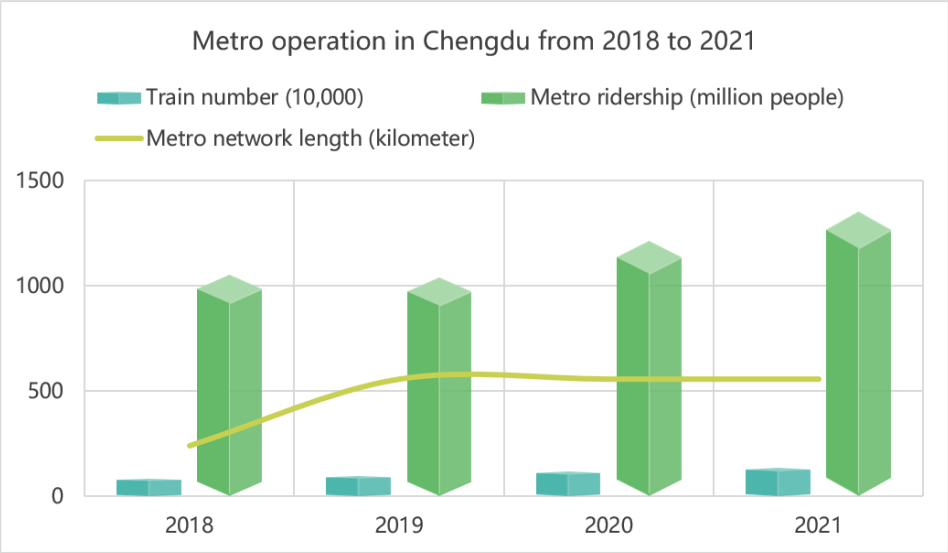


Figure 4. Metro operation in Chengdu from 2018 to 2021

The following data can be obtained from Fig. 4: In 2018, the subway ran 852,877 times, an increase of 38.3%; The number of subway passengers reached 1,051.906 million, up 50.5% year on year; In 2019, 962,252 subway trains were operated, an increase of 34.17%. The number of subway passengers reached 104038281 million, up 62.10% year on year; In 2020, 1,166,327 subway trains were launched, an increase of 23.5%. The number of subway passengers was 1212.649,000, down 13.4% year-on-year; In 2021, 1,362,602 subway trains will be launched, an increase of 61.8%; The number of subway passengers reached 135,551,000, an increase of 62.3% [8].

3.2.2. The benefit of metro to the economic development of Chengdu

The proportion of real estate economy in Chengdu's economic construction is relatively large, which plays an important role in promoting economic growth and improving urbanization construction.

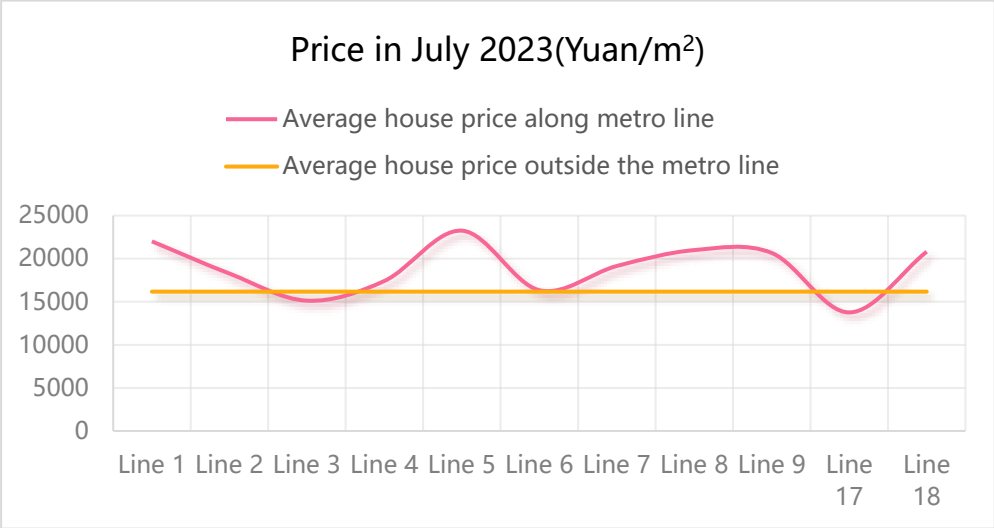


Figure 5. Comparison of average housing prices along Chengdu Metro lines and non-metro lines in July 2023

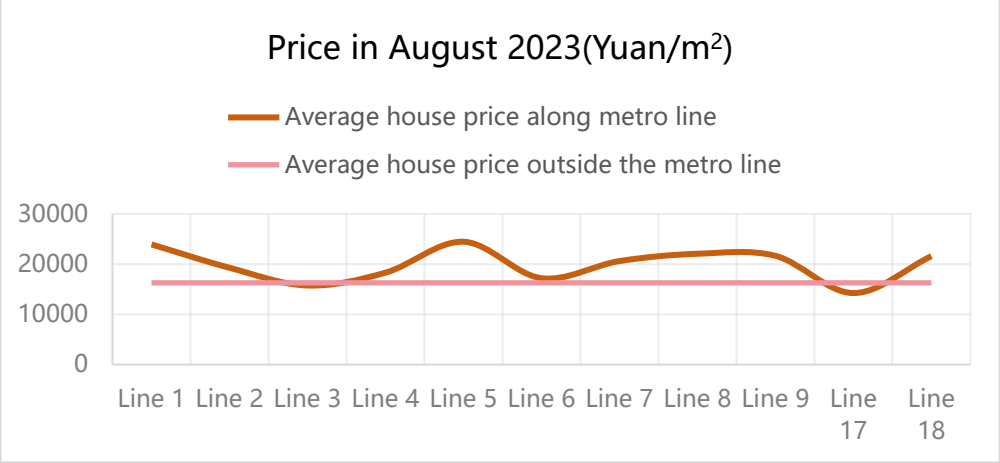


Figure 6. Comparison of average housing prices along Chengdu Metro lines and non-metro lines in August 2023

Fig. 5 and Fig. 6 compare the housing prices along Chengdu Metro lines with the average housing prices along non-metro lines in July and August 2023. The stations of Line 1, Line 5 and Line 9 are mostly located in the central areas or core hub areas of the city, attracting more and more people to settle down, and the housing prices are much higher than the average housing prices in non-metro areas. As can be seen from Fig. 7, even in the same area, the surrounding housing prices are gradually increasing due to the convenient opening of the subway line, the influx of people, the settlement of more enterprises and the upgrading of industries and other factors.

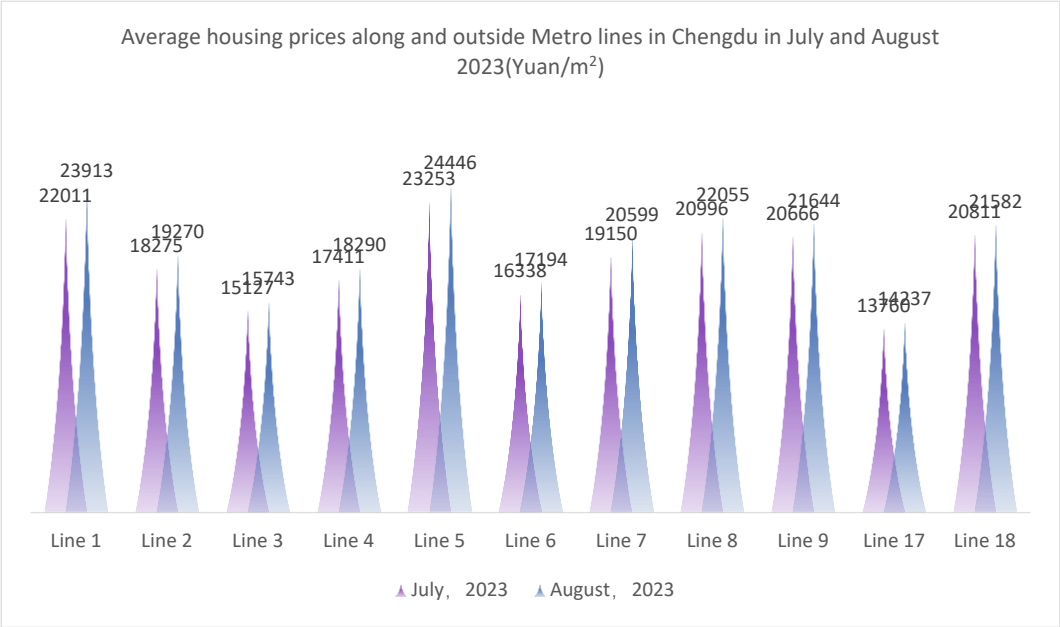


Figure 7. Comparison of average housing prices along Chengdu Metro lines and non-metro lines in July and August 2023

With the increasingly convenient subway transportation, the sales volume of houses has increased significantly, especially in areas with very convenient subway transportation, the sales volume of houses has increased significantly, which has a certain driving effect on the real estate economy of Chengdu [9]. Secondly, the rapid development of real estate purification machines along the subway, and Chengdu will further improve the subway facilities and construction in the future development process, and the improvement of urban transportation convenience is bound to attract some non-local residents, to inject fresh vitality into the local real estate economy and create strong conditions for the overall development of the local economy. Third, the housing sales situation along the subway

line and in the area to be opened is good, which promotes the rapid development of the surrounding real estate economy and the overall economic development [10].

4. Conclusion

4.1. Analytical Summary

Through the data collection, research and analysis of land supply area and housing price along and non-along the high-speed railway, and housing price along and non-along the metro, the following conclusions can be drawn:

(1) Rail transit facilitates the travel needs of residents and saves commuting time, which leads to an increase in the occupancy rate near the traffic stations and along the subway lines, more abundant urban construction, and more perfect infrastructure configuration of the living circle.

(2) Rail transit improves the overall public service level of the city, the siphon effect of the city is strengthened, attracting more people and enterprises to flood into the city, and the spatial connectivity within the region is strengthened, which brings the growth of urban economic benefits and increase urban GDP growth.

(3) While promoting economic growth, the opening of rail transit such as subway also has positive benefits for employment and industrial development. Quick access to destinations via rail transit allows businesses in central urban areas to employ workers from the city periphery on a large scale. At the same time, it can attract enterprises in the secondary industry and the tertiary industry to land near the site and increase the city's GDP.

4.2. Relevant Suggestion

Urban rail transit is the backbone infrastructure of urban economic and social development, which not only needs national planning guidance, but also needs related policy support and guarantee.

Facing the government level, the development of urban rail transit should be included in the national "14th Five-Year Plan", further reform and improve the system and mechanism, and strengthen the overall coordination and classified guidance of the development of urban rail transit. Relevant transport departments have studied and improved comprehensive transport plans for major urban agglomerations, metropolitan areas and large and medium-sized cities, built "diverse transport networks", and coordinated the "four networks" integration and coordination of trunk railways, regional railways, intercity railways and urban rail transit. At the same time, government will improve economic, technological, technological and industry-related development policies, increase transportation investment and high-tech funds, and provide guarantee for the healthy development of urban rail transit.

At the industry level, comprehensively carry out the evaluation of the operation efficiency of rail transit, strengthen the independent research of key equipment and core technologies of rail transit, achieve the autonomy of core equipment, and reduce the safety risks of industrial development. For units with good operational performance, appropriate inclines should be given in terms of national science and technology fund support and innovative project establishment, etc., and the whole industry should be guided to actively adopt new technologies, improve the level of operation and maintenance, and improve the quality of rail transit operation service and operational efficiency. At the same time, rail transit enterprises are encouraged to promote the application of the latest scientific and technological achievements in energy conservation and consumption reduction, recruit more high-tech talents to learn and master technology, build innovation sharing platforms, provide industry technical services, and play a leading role in the industry.

References

[1] Ministry of Housing and Urban-Rural Development. We will comprehensively promote the development of a comprehensive urban transportation system. People's Daily, 2023.

[2] Huang Yangqian. Research on coupling coordination degree between urban rail transit and urban development. Southwest Jiaotong University, 2022.

[3] Yan Qing. Study on the impact of urban rail transit on high-quality economic development. Zhongnan University of Economics and Law, 2021.

[4] Lei Min. Comprehensive economic benefit analysis of rail transit. Central University of Finance and Economics, 2022.

[5] Yang Tingting. Analysis on the impact of high-speed rail economy on the urban development of Chengdu. School of Economics, Hefei University of Technology, 2019.

[6] Li Xinyi. Study on the impact of rail transit construction on the land price and land layout around the station: A case study of Hefei Rail Transit Line 2. Anhui University of Architecture and Architecture, 2021.

[7] You Zi, Wang Fei. China's transportation infrastructure development achievement and its influence on urbanization. China Collective Economy, 2022.

[8] Geng Yiyang. The influence of urban rail transit construction on Xi 'an's economic development. Heilongjiang Science, 2022.

[9] Wu X. Research on the relationship between urban rail transit network planning and urban economic development. Urban Rail Transit Research, 2023.

[10] Liu Xingquan, Hu Jieting, Hou Ling. Analysis on the impact of Chengdu Metro Operation on Chengdu's social and economic development. Journal of Sichuan University for Nationalities, 2012, (2).