# From Soviet Pattern to Chinese Practice

## A Historical and Empirical Review of Wuhan 1954 Master Plan with GIS and Spatial Syntax

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### Abstract

Because of post-war reconstruction, urban planning became the most important affair since the P.R.China founded. During the "First Five-Year Plan", "The Urban Planning of Eight Key New Industrial Cities" laying the foundation of China's modern urban planning, showed the process from drawing on Soviet planning experience to the theory of Chinese urban planning. Wuhan was one of them. The 1954 Master Plan as the first planning clarified the characteristics of a typical long-term plan, with the Soviet pattern's far-reaching impact on it. This study takes the Wuhan 1954 Master Plan as the main research object, using the existing research results and historical documents introduced a series of activities around it, considering the relationship between the Soviet pattern and the Wuhan planning in the early days. The planning data in different periods are transformed into the database to analyze the space in GIS, shows the actual impact of the Soviet pattern under the implementation of the plan for 65 years, and examine its significance and value. The results can reflect the following influence of Wuhan City Master Plan in 1954. This study uses GIS to analyze historical data, and establish a verification relationship between planning and reality.

### Keywords

Wuhan modern urban planning history, master plan, Soviet planning pattern, GIS, spatial syntax

### How to cite

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## INTRODUCTION

At the beginning of the founding of the PRC in 1949, China faced the problem of rapid urban repair after the war. At the same time, due to the ideology of a socialist country, the urban planning system has changed from the Soviet model since the 1950s. At that time, the Chinese urban planning system began to reflect the background of the planned economy, and its guiding ideology, planning theory, planning method, and planning system all showed a completely different look from western modern urban planning. All this is in preparation for socialist urbanization. In the 1880s, some Western scholars began to study socialist urban planning in this period, such as Town and Revolution (1970) by Kopp[1], The Socialist City (1979) edited by French and Hamilton[2] and The Soviet City by Bater (1980)[3].

Victor (1996)has take the Chinese capital Beijing as an example to study the influence of Soviet planning on Beijing from 1949 to 1991. He believed that Soviet planning had huge impact on China[4].

Robert et al. (2005)found that the development axes of the Stalin era, which tended to radiate outwards from the city center, exhibit urban qualities that were lacking in later phases of urban development. The extensive growth of the Moscow region altered the nature of settlements located directly on the city boundary, as these became the sites of large housing developments and industrial zones.[5]

Christina (2018)has indicated that standardization is characteristic of Soviet planning. Standardization has the advantages of low cost, strong dissemination, and easy replication. So the Soviet model was an unique product of the times.[6]

For Chinese cities, relevant research results have only been valued in recent years. Some Chinese scholars, such as Li (2008)has reviewed the modernism's influence on the Soviet Union's architecture and urban planning from 1920s to 1950s, their pursuit of ideal socialist city forms, and the reality of socialist urban planning development. And she tried to reveal the relationship between the ideology and urban planning, the distance between the ideal and the reality, as well as reasons why the modernists failed in the Soviet Union.[7]

LI has empathically analyzed the introducing process and main contents of socialist cities' planning and construction thought of the Soviet Union in the 1930s.and preliminarily studied the historical origin and context of the Soviet planning pattern. It was proposed that the theory of Soviet socialist city construction was based on the technical development of urban planning in the world, especially in Europe, and is the product combining the theory of scientific socialism with the concrete practice of Soviet urban construction.[8]

Xu and LI. have proved that the international urban planning theory in the 20th century has remarkable characteristics of cross-cultural communication. After 1949, the "Soviet Model" of urban planning came to China through top-down promotion.[9]

In this paper, we have reviewed the urban master plan in Wuhan in 1950s by lots of Historical Documents. In addition, we tried to use the space syntax to quantitative analysis the development in Wuhan. Space syntax was a good tool to response to the dynamic changes in a city.

The index of integration could be used to study urban structures and human behaviors.[10] This paper would use the spatial syntax method in the planning evaluation part.

## 1. OVERVIEW OF WUHAN MASTER PLAN COMPILATION BACKGROUND

During 1950s, China need to develop industry rapidly. Many cities have developed industry as their primary goal and Wuhan was one of them[11]. the Wuhan government began to compile the urban master plan based on the city status and followed the '156 construction Projects'[12]. The plan was gradually improved from 1953 to 1955[13] and had a great impact on the next 20 years[14].

## 2. PRELUDE--THE DRAFT OF WUHAN MASTER PLAN

The Wuhan Urban Master Planning was drafted on the December of 1953 (Figure 1)with the guidance of Soviet experts Dmitry Dmitrievich Barakin[15], The plan proposed the urban development axis and functional zoning, and introduced the urban road network and urban axis. It provided guidance for the city's subsequent construction work. Wuhan Urban Master Planning 1954 was developed on the basis of the Wuhan Urban Master Planning 1954. The main axis of the three towns, "Zhongshan Park Front Square-Jijiazui-Nananzui-Hongshan Square", the Wuchang new urban square and the Qingshan area were built with the influence of Barakin.

## 3. THE MAIN CONTENT OF WUHAN MASTER PLAN 1954

The overall urban planning and layout of Wuhan in 1954 (Figure 2) was based on the joint selection of factories in 1952 and the draft urban planning of Wuhan in 1953. The urban planning and suburban planning with heavy industry as the main part were determined. Through the delineation of the regional centers, from the perspective of the integration of the three towns, the main axis of the three towns was determined. In addition, port terminals and warehouses were arranged along the Yangtze River in combination with water transport conditions. At the same time, the master plan of Wuhan always attached the importance to the urban geographical elements, focusing on the existing embankment and old cities, and layout the urban space and expanded the urban scale.

In terms of urban center, the master plan of Wuhan City in 1954 determined several center areas corresponding to the main axis from the Schematic plan of Wuhan City Center Planning in 1954 (Figure 3). Most of them used geometric composition to planed the road network and land, and flexibly decorated the axis with square, main road, residential area along the street

facade and other elements, presenting a symmetrical, neat and spectacular urban landscape. Each axis was connected with each other, or was the extension of urban trunk road, or was the branch of the main axis of three towns. It was not difficult to see from this that the general layout of the plan always kept the scientific arrangement of the overall spatial sequence of the city, which made the connection between regions close without losing its artistic effect.

In terms of land use function organization, the master plan of Wuhan City in 1954 was roughly divided into several areas on the basis of urban, suburban and outer suburb. The main function types of the areas were different, including industrial area, warehouse area, staff residential area, culture and education area, etc. However, the functions among regions could be organized scientifically to form a good complementary relationship. For example, the staff residential area, namely the warehouse area, could provide more favorable traffic and living conditions for the industrial area, while the warehouse area could facilitate the communication between the staff residential areas on both sides of the river. In addition, according to the development characteristics of each specific planning area, different quotas were used to reserve the necessary land.


Fig. 1. Wuhan City Planning Draft in 1953. The map mainly determines the city center location, land use zoning, and city outline that are needed in Wuhan urban planning.

In terms of functional organization of land use, the Wuhan Urban Construction Committee mainly divided the planning area into detail, namely the newly-built industrial zone of Dawangmiao, the newly-built industrial zone of Boyushan, the newly-built industrial zone of Qingshan, the reserved industrial zone of Guishan North, the reserved industrial zone of Guanshan, the reserved industrial zone of Changfeng Nanxun , the reserved industrial zone of Shilipu, Xujiapeng Workers 'Residential Area, Honggang City Workers' Residential Area, Wuchang New Urban District, Hongshan Central District Luojiashan Cultural and Educational Area, Dijiao Warehouse Area, Qingshan Warehouse Area, Baishazhou warehouse area and other specific planning areas. At the same time, according to the actual geographical environment of Wuhan, the wetland ecosystem along the river has been classified into scenic areas and protected areas. In addition, according to the development characteristics of each specific planning area, different quotas have been used to retain the necessary land.

The planning focus of newly built residential neighborhoods is mainly concentrated in the new urban area of Wuchang, that is, the specific planned areas such as the newly built employee residential area of Xujiapeng and the employee residential area of Honggang City. The layout of the employee residential area was closely related to the neighboring industrial enterprises. For example, the Red Steel City employee residential area located in Qingshan Industrial Zone was adjacent to Wuhan Iron and Steel Plant (Figure 4).


Fig. 2. Schematic plan of Wuhan City Center Planning in 1954. The figure mainly reflects the urban planning plan of Wuhan City Master Plan in 1954.

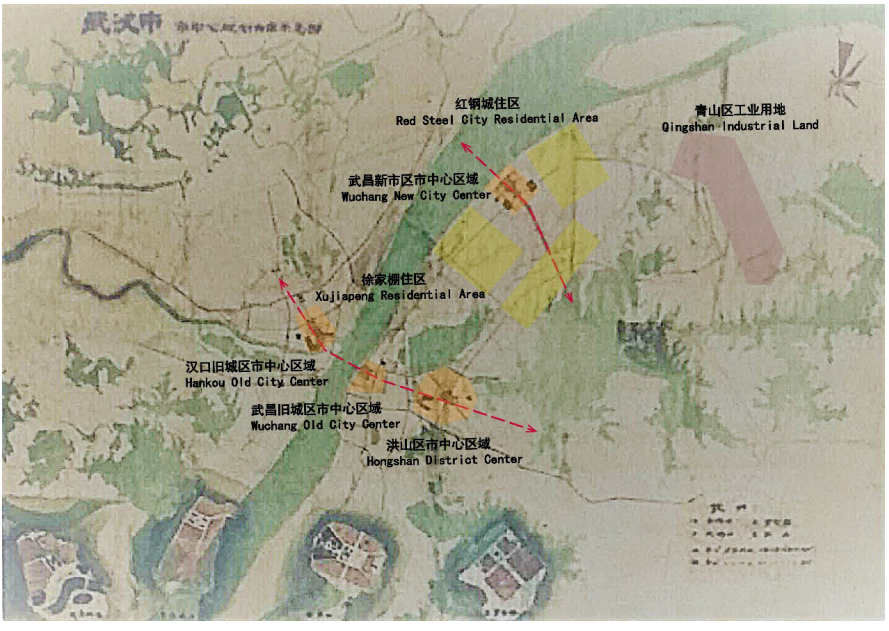


Fig. 3. Historical photos of local areas of Wuhan. The map shows several places in Wuhan that have been focused on since the completion of the Wuhan City Master Plan in 1954.

The planning of new residential neighborhoods was not only to address the living needs of workers in industrial enterprises, but was also part of the urban landscape. Therefore, new residential neighborhoods often adopt the practice of merging neighborhoods to keep the neighborhood units in a proper design aesthetic in the overall urban planning floor plan. For example, the staff residential area of Red Steel City was integrated with the neighborhood planning, so that it had a planar scale similar to that of the central square of Wuchang New City. The new residential neighborhood planning and overall planning had a strict sense of sequence and unity in composition. And this way of integrating neighborhoods was also an economic practice in urban planning activities. It was to merge single, too small neighborhoods in urban planning, so that the surrounding street construction would not be complicated and chaotic, and also facilitate city management. The integrated neighborhood was also more conducive to the development of public utility projects to develop the green space and public facilities required by residential neighborhoods.[16]

## 4. ANALYSIS OF THE IMPLEMENTATION EFFECT

The concept of spatial syntax was proposed by Hiller. He believes that the urban spatial road grid is highly related to social attributes, and the social functions in urban space can be explained and optimized through the analysis of the spatial road grid. A rational cognitive approach was also put forward to understand social functions. The integration degree

of important parameters of space syntax reflects the closeness of the relationship between space and space, and places with high integration can introduce more people flow and social functions.[17] Due to the advantages of spatial syntax in quantitative research, it is widely used in the study of urban morphological development.[18] Zhu and others once converted the Suzhou city road network model into an axis map and performed spatial syntax calculations, and superimposed the analysis of the status quo elements of the city. They found that the degree of integration was positively related to the core degree of the city, and social functions were often densely distributed on highly integrated roads. He believed that in cities, highly integrated streets were often urban trunk roads, and highly integrated roads form urban centers.[19] In order to increase the use of spatial syntax, B.Jiang and others developed an AXwoman plug-in based on a GIS system. This plug-in can perform spatial syntax calculations in GIS, while taking advantage of the GIS system, and linking space information such as architectural uses and plots in cities to expand urban research.[20] Due to the reliability of the plug-in and the expansibility of GIS, more and more scholars calculate spatial syntax in GIS.[21]

In this study, we converted the real-life map of Wuhan in 1949, the master plan of Wuhan in 1954 (Figure 5), the schematic diagram of Wuhan in 1959, the satellite map of Wuhan in 1968, and the current status of Wuhan in 1978 into machine calculation city segment model (Figure 6). We use AXwoman in GIS to calculate the line segment model so that more discoveries can be made in the future. The calculation results are visualized in GIS using the natural discontinuous segmentation method (Jenks). This classification method can better distinguish the street integration degree, which is convenient for our analysis.[22]

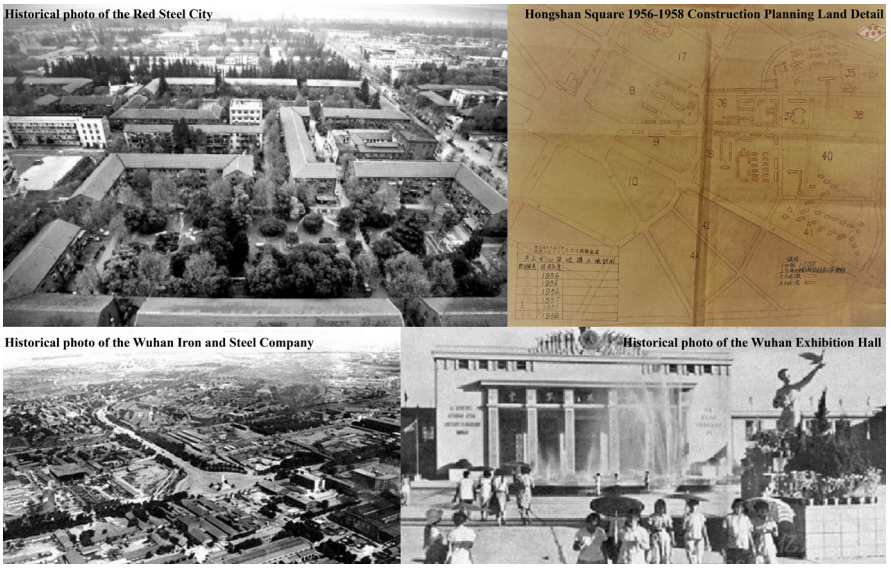


Fig. 4. Historical photos of local areas of Wuhan. The map shows several places in Wuhan that have been focused on since the completion of the Wuhan City Master Plan in 1954.

Wuhan was divided into three administrative towns in 1949, and there were no bridges between them. But the space syntax must not be used to calculate isolate lines. So we add line segments at the corresponding positions to represent the Yangtze River Bridge and Jianghan Bridge to ensure that the calculation can be completed. After analysis, it was found that the integration degree of Hankou in Wuhan was relatively high in 1949, and social activities and interpersonal communication mainly occurred here.

The 1954 Wuhan Master Plan is an important object of this study. It was compiled by Wuhan Urban Construction Committee. Compared with the current situation in 1949, high-integration streets were mainly distributed in Wuchang, the road network density and quantity in Wuchang were newly added to the plan. It was planned to transfer the city center to Wuchang, and at the same time Wuchang would develop along the river to the north and inland to southeast. In the picture, the center radial road structure appears at the location of Hongshan Square.

1959 Wuhan City Construction Planning Schematic was a short-term construction plan issued after the overall urban planning in 1954. In this version of the plan, high-integration neighborhoods were mainly located along the Yangtze River in Hankou and Wuchang. This version of the plan continues the idea of the central location and development direction of the city in the previous version of the plan. The central radial road structure in the current location of Hongshan Square in this version of the plan has been retained.

The satellite image was taken by USGS in 1968. After ten years of construction, compared with the status quo in 1949, the Hankou Chinese Concession is still the center of urban social activities, but the social activities in Wuchang have gradually increased. The figure reflects the gradual implementation of the 1959 plan.

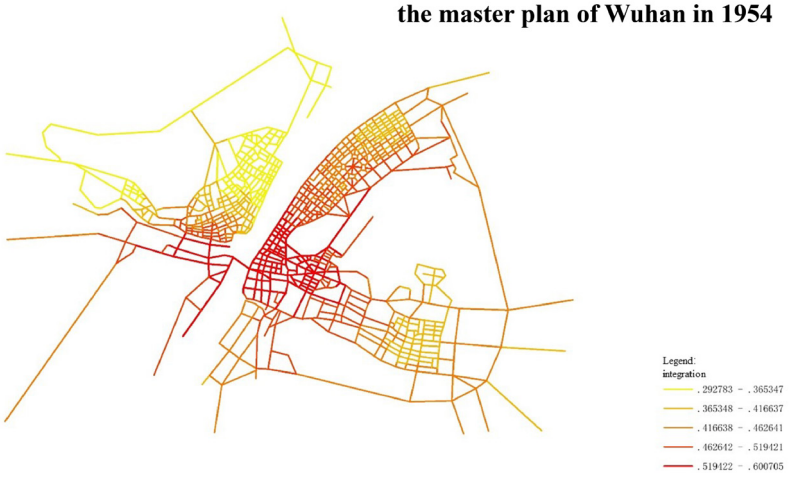


Fig. 5. Urban line model of Wuhan City Master Plan in 1954. This map is a model of the city line segment of the Wuhan City Master Plan in 1954. It can be used to observe the issues such as the relevance of the road system in the 1954 plan.

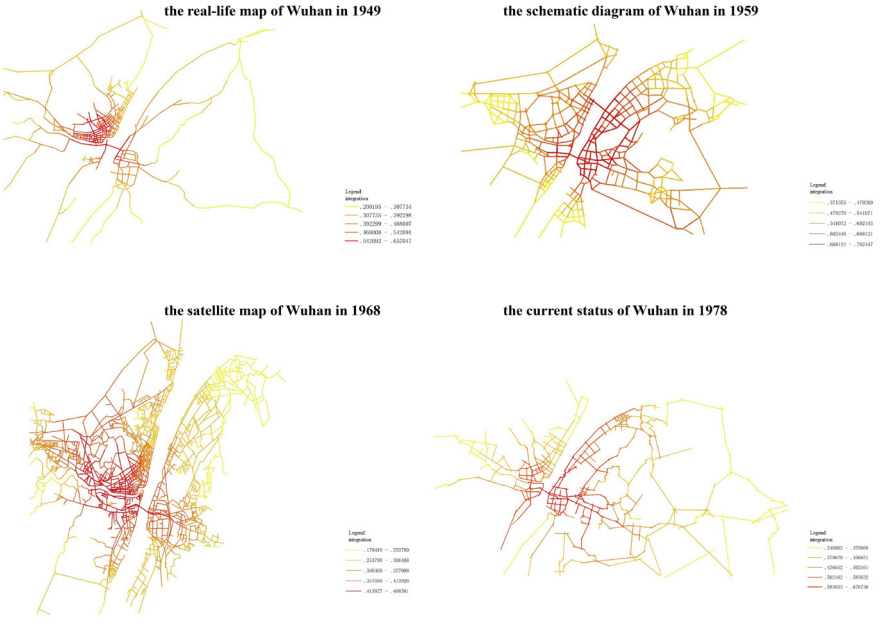


Fig. 6. Urban line model of Wuhan's planning implementation status from 1949 to 1978. This figure is mainly a line segment model of the urban floor plan that is closely related to the Wuhan City Master Plan in 1954.

After the establishment of Wuhan Urban Planning Administration in 1978, Wuhan City Status Map was completed and guided by the Municipal Construction Commission. Compared with the status quo in 1968, the integration degree of Wuchang Road was higher than that of Hankou, and the city center moved to Wuchang. In the Chinese planning system, the overall planning period is 20 years, and the status quo 20 years later can reflect the implementation of the 1968 plan. Compared with the 1954 plan, the high-concentration streets were mainly located in Wuchang. Social activities and exchanges mainly occurred along the Yangtze River in Wuchang and southeast of Wuchang. The central radiation road planned for Hongshan Square had also been completed. It can be seen that these 20 years of urban construction were consistent with the planning ideas of 1954.

## 5. ANALYSIS OF PLANNING PARADIGM CHARACTERISTIC

### 5.1 PARADIGM OF CROSS-BORDER COMMUNICATION

Because of the time background and political reasons, in 1954 Wuhan's urban master plan mostly adopted the Soviet planning model. This is important evidence of the influence of Soviet planning on Chinese planning. China had good relations with the Soviet Union at that time, and at the same time Chinese cities needed a lot of construction, so the Soviet Union

technically assisted China. Such assistance includes the invitation of Soviet architects and planners such as Mu Xin, Kravtyuk, Barakin, Sharyshev, etc. to work in China,[23] and the introduction of Soviet professional books, such as the Standard Design Law for Housing Complete Sets by Barakin In China, Soviet experts were invited to give lectures in the country, such as Solonovich, Misha Mahov, etc, and used this class to teach planning skills.[24] These aids are an important basis for the influence of Soviet planning on modern Chinese planning.[25] Under the influence of Soviet planning on China's urban construction, China has tried to use the technical specifications of Soviet urban planning as a template as a rule in urban construction.

## 5.2 PARADIGM ABSORPTION AND FORMATION

In the historical activities of Wuhan City Master Plan in 1954, the direct absorption of the "Soviet Model" can be traced back to the results of the joint plant selection work. For example, the Wuhan Iron and Steel Plant was located in Qingshan Industrial Park, and its preliminary design was completed by the Soviet Design Institute, and then the Chinese personnel carried out the overall design of the off-site project based on the preliminary design graphic results. Such a coordinated relationship made it necessary to coordinate the construction of the steel mill in the preparation of Wuhan's overall urban planning in 1954. In terms of the pictures and text results of Wuhan City Master Plan in 1954, the nodes that absorbed the Soviet model for planning and design were more abundant.

However, in the process of assimilating Soviet planning ideas into local planning practice, there is also a transformation relationship in the preparation work of Wuhan's overall urban planning, so that practice is not tied to theoretical dogma. For example, considering economic conditions such as the supply of local materials, professionals in China have adjusted the unit cost quotas for workers' residential areas in off-site projects in the Qingshan Industrial Zone, reducing unit cost to 50 yuan per square meter, compared with the average cost of building a city house in 1953 was 93.4 yuan per square meter, down by nearly 46%.

In the Wuhan Urban Master Plan, the establishment of an institutionalized process for this paradigm is a long process that spans the entire planning period. Just as the research results obtained from the implementation effect analysis mentioned above, in the 20 years including the Vision Period, Wuhan's urban master plan was gradually deepened and implemented, and finally formed a three-town integrated urban pattern. The scale of the city was expanded to the state of the planning outline under the jurisdiction of the suburban planning part in 1954, which enabled the technical design planning made in 1954 to be transformed into a planning system and affected the development of Wuhan today continuously.

## 5.3 EVALUATION ON THE HISTORICAL STATUS AND RATIONALITY OF WUHAN URBAN PLANNING PARADIGM

According to the above, we are able to clearly define the technical results of planning in 1954. Before and after the development of the second edition of the master plan in 1978, the Soviet planning paradigm had a profound impact on the construction of modern cities in Wuhan.

However, through the historical perspective of civilization, which allows us to analyze and discuss in the overall perspective of the history of modern Chinese urban planning, we can find that Wuhan's overall urban planning in 1954 has a typical dual paradigm characteristic, that is, the process of forming a general paradigm and its special speed of paradigm formation.

Compared with the current implementation results of key cities such as Lanzhou, it can be discerned that during the period of self-regulation, the construction of key cities in various places were affected by the Soviet planning paradigm to varying degrees. For example, the eight major cities like Wuhan, Lanzhou, Datong, and Xi'an all have the characteristics of Soviet urban planning and design. That is, the use of strict and symmetrical design forms to achieve urban landscape art, there were a large number of absorption and conversion of Soviet urban planning quotas, too.

Among them, Xi'an's urban master plan contains 'Suggestions from Soviet urban planning experts Barakin: China's urban planning quota can adopt the Soviet 1947 standard within five years and the Soviet 1952 minimum standard within 20 years'. Therefore, the research on the history of Wuhan urban master planning can provide an important basis for the study of the modern urban planning paradigm in China, and can also serve as a parallel object to promote the current scholars' research on the history of urban planning in different places in the same period. Based on the universal characteristics of paradigm formation, Wuhan's urban planning paradigm from development to establishment also had its particularity, especially with its own paradigm's perfection speed and deepening degree. Compared with the current urban planning process of cities in all regions, the implementation effect of Wuhan's urban planning had become deeper and faster. Among them, of course, there are the influence of Wuhan as the provincial capital's city level and the development positioning of key industrial cities, and it is also closely related to its urban construction history. For example, in the modern urban planning process, Wuhan had undergone the period of independent construction of the three towns and the period of integration of the three towns. Although the western advanced planning paradigm was absorbed and integrated to a certain extent during the same period, its implementation effect was not significant, which made the status quo of the city still followed the previous form until 1949. The three old urban areas were dominated by fishbone-type public transportation systems, and this status of the city had greatly facilitated the implementation of the technical results of the urban master plan in 1954. For another example, by 1949, the road system from Xujiapeng to Qingshan in Wuhan had certain accessibility, and it had experienced many embankments and filling projects along the banks of the river had been able to provide assistance for the redevelopment of the city scale. It established a certain status quo foundation for the overall industrial layout of Wuhan City.

## 6. CONCLUSION

The formulation and implementation of the Wuhan Urban Master Plan in 1954 continued the development thought of the integration of the three towns in modern times and deepened the implementation of the construction of the main urban area of the three towns' cohesion. Its

visionary layout of the urban spatial pattern provides great convenience for today's Wuhan to expand the city scale. The Ministry's planning results have gradually transformed Wuhan's urban nature from a consumer city to a newly industrialized city, which in turn provided a strong material foundation for Wuhan's urban development and comprehensive functions, and laid the foundation for Wuhan's industrial development. So that Wuhan can not only promote regional integrated development through the political positioning of the provincial capital, but can also make good use of its industrial advantage of heavy industry to contribute to regional economic development and resource integration continuously. However, it was precisely because of the extreme development of industry that there were some hidden dangers in its industrial structure, and the urban renewal problems faced by the old industrial zone of Wuhan today began exactly from this.

Similarly, as a typical overall planning document compiled and drawn during the self-discipline period in China, this research achievement was not only for enriching the research perspective of urban specialized history, and it is more helpful for us to explore the laws of the modern urban planning paradigm in China. It provides a very typical case object for confirming the transnational relationship between China's urban planning ideas during the self-discipline period and the Soviet planning and construction mode.

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## IMAGE SOURCES

Fig. 1 Archives Office of Wuhan Land Resources and Planning Bureau, Wuhan Land Resources and Planning Archives (Planning, General, 3).
Fig. 2 Wu Zhiling, Hu Yidong, Wang Xie, Cheng Gang, Chen Jingyuan, etc. Atlas of centennial planning in Wuhan.(Beijing: China Construction Engineering Press. 2009).pp76.
Fig. 3 Wu Zhiling, Hu Yidong, Wang Xie, Cheng Gang, Chen Jingyuan, etc. Atlas of centennial planning in Wuhan.(Beijing: China Construction Engineering Press. 2009).pp77.
Fig. 4 Hubei Archives [S850-2-259②].
Fig. 5 Self-painting.
Fig. 6 Self-painting.