

Urban Planning and Spatial Evolution Processes in Taiyuan and Relevant Influencing Factors

Kairui Guo*

College of Construction and Engineering, Shanxi College of Applied Science and Technology,
Taiyuan, Shanxi, 030000, People's Republic of China

* Corresponding Author Email: guoxinrui7786@link.tyut.edu.cn

Abstract. As a famous historical and cultural city in China, Taiyuan City has a history of more than two thousand years with a rich evolution of its urban space. This paper discusses the influencing factors of urban space by describing the historical background of Taiyuan and the evolution of urban space. The spatial layout of Taiyuan in the Ming Dynasty was based on the idea of the palace as the main planning of the royal city. In the Qing Dynasty, Taiyuan still shared the walls with the Ming Dynasty, and the city's overall framework did not change much. The city was built mainly in traditional politics and military affairs during the Ming and Qing dynasties, with some related facilities and buildings. After the Republic of China, the layout of the city was influenced by Western urban planning ideas, endowing more functions to the internal architecture and establishing many spaces with living, cultural and educational significance. After the founding of New China, Taiyuan became a city of heavy industry focusing on the chemical industry, coal, machinery, and metallurgy.

Keywords: Urban Planning; Ming and Qing Dynasties; Republic of China; Spatial Evolution; Taiyuan City.

1. Introduction

Historically, the city is a human-geographical phenomenon following the development of social productivity, both as a product of the development of human civilization and as a social space where civilization was nurtured and created. With the development of the city, the function of the city also gradually changed, as the areas within the city began to be divided, developing from a single-function gathering place for the exchange of goods between farmers and artisans to a comprehensive city with financial, trade, service, cultural and entertainment functions.

The local geographical environment influenced the development of ancient Chinese towns, political systems, and philosophical thinking, which combined local experience in urban construction gradually to form a complete body of urban planning thought, with the obvious emergence of the 'city'. It was not until modern times, with the development of the economy and the increasing demand for quality of life, that public spaces such as parks, libraries, and museums emerged in the city.

Taiyuan is a major military and cultural city in northern China, doubling as a national historical and cultural city with a history of over 2,000 years. Because of its long history, Taiyuan is rich in the evolution of its urban space. Taking the city of Taiyuan as an example, this paper seeks to describe its historical background, analyze the evolutionary process of urban space and discuss the relationship between urban space and culture and humanity.

2. The background of the historical evolution of the city of Taiyuan

Taiyuan originates from the Jinyang Ancient City, built in 497 BC at the intersection of the Taiyuan West Mountain with Fen River and Jin water. During the Qin Dynasty and Han Dynasty, two sub-cities were built both inside and outside; During the Western Jin Dynasty, the city was expanded to a larger scope with a layout of "large towns overlapping small towns with connected buildings"; During the Northern Wei Dynasty, as it was an auxiliary capital, the Twelve Palaces of Jinyang were built; During the kingdom of Qi, Jinci Temple was built, and the rock cave and temples were greatly developed; During the Sui Dynasty, three inner cities were built with a structure of "Pin

in Chinese word"; During the Tang Dynasty, channels were built across the Fen River based on the above three cities with the largest strength in building cities; During the Song Dynasty, Jinyang Ancient City was destroyed, and the city site was moved to the east bank of the Fen River. During the early Ming Dynasty, the city was expanded to the east, south, and north based on the city in the Song Dynasty, forming an inner and outer city layout [1].

Taiyuan received faster development during the late Qing Dynasty and the Republic of China, especially in 1907, when Taiyuan was incorporated into the city system of North China, with Tianjin as its center. After the turbulent period of the 1910s, the political situation in Shanxi was relatively stable from the 1920s to the first half of the 1930s, when the government with the head of Yan Xishan attached more importance to municipal construction, which promoted the development of Taiyuan. 1949 saw the establishment of the People's Government of Shanxi Province, which changed Taiyuan into a municipality directly under the central government. By 1959, Taiyuan covered two counties and four districts under its jurisdiction, including Yangqu County, Qingxu County, Gujiao Industrial and Mining District, South Urban District, North Urban District, and Hexi District. Taiyuan has 6 districts and 3 counties, with one county-level city under its jurisdiction.

3. The evolution of urban space in Taiyuan City

The history of the founding of Taiyuan is complex due to military and political reasons as well as geological changes and has only become more structured since the Ming and Qing dynasties [2]. Therefore, this paper focuses on the spatial evolution of the city from the Ming and Qing dynasties onwards.

3.1. The Ming period

The expansion of Taiyuan in the Ming dynasty inherited and developed the idea of the traditional Chinese urban layout of a palace-dominated royal city plan. On the one hand, it emphasizes the role of the similar medial axis of the city, dominated by the palace of the Emperor of Jin. On the other hand, it uses the original plan of the old city of the Song Dynasty and combines it with the topography to present irregular streets to meet the needs of the rulers.

The site of the palace city of the Emperor of Jin in the early Ming Dynasty initially followed the requirements of Zhu Yuanzhang's "Jin with New Taiyuan City", i.e., the construction of the Palace City of the Emperor of Jin based on the former city of Tang Jinyang in Fenxi. However, this site was later moved to the Palace City of the Emperor of Jin in Taiyuan. Taiyuan City, at that time, had about 90,000 square kilometres (Fig. 1) [3] and covered the north of the present Yingze Avenue, west of North Construction Road, south of North Street, and east of Xinjian Road.

Most northern cities in ancient China had a relatively regular spatial layout, with official buildings at the center and buildings along the main roads, most of which had a more obvious central axis and intersecting crossroads. However, Taiyuan was an exception, where the main buildings of the official government, such as the Jinyang official building, were not built on the central axis, and most of their main intersections comply with the shape of "Ding" in the Chinese word. The overall plan shows that Taiyuan City in the Ming Dynasty continued to keep the Palace of the Emperor of Jin as close to the middle of the city as possible in order to play a role as an approximate central axis. It formed a political spatial layout of "one belt (the political belt) and two districts (the official and the royal districts)". The Government Offices and Yingze Gate Street are straight ahead: the region of palaces took Chengen Gate Street as its north-south axis, thus forming a political belt at the center of the city [4].

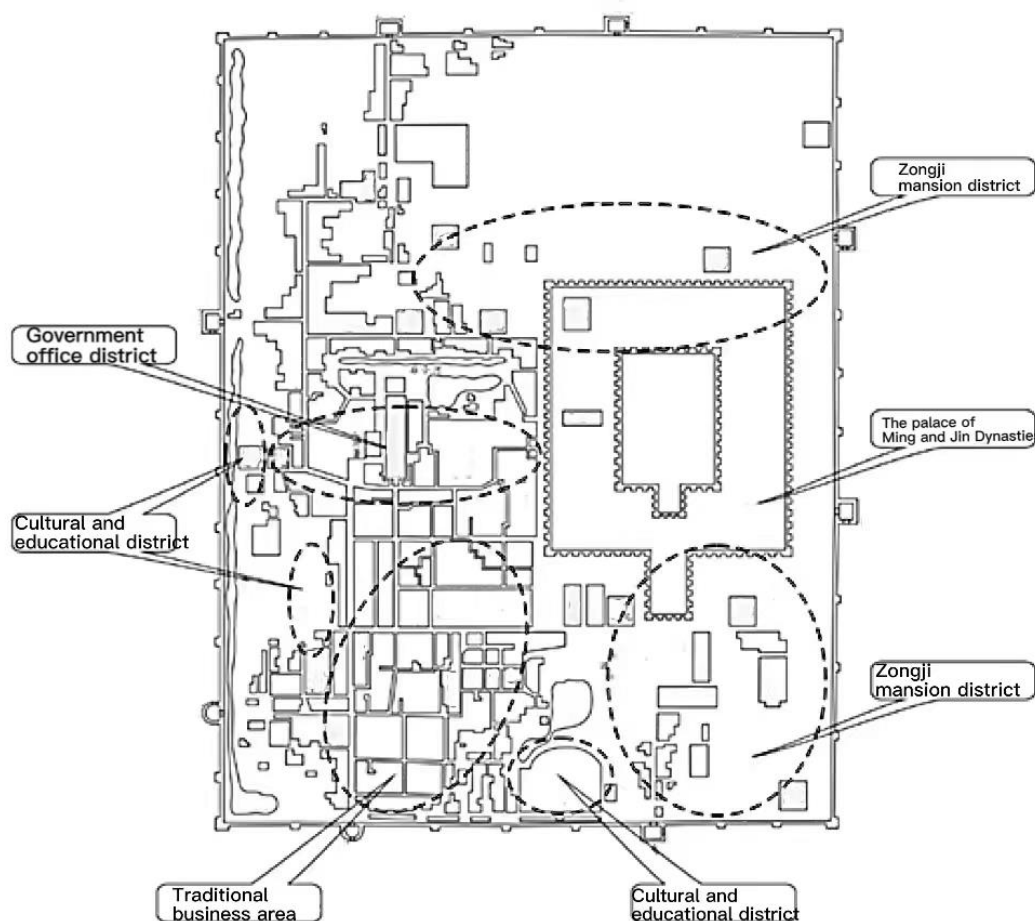


Fig. 1 Diagram of the spatial layout of the urban area of Taiyuan during the Ming Dynasty

3.2. The Qing Period

The overall framework of the city did not change significantly, but the spatial layout changed markedly with the reconstruction activities.

The changes in the urban spatial layout in the early Qing period were related to the Eight Banners garrison cities and the Green Barracks. The layout and function were still dominated by the traditional political and military setup. The changes occurred within the city, i.e., they were 'intrinsic adjustments'. The government administration area, centered on the Fuyuan Clan Office, remained the political core of Taiyuan in the Qing Dynasty and is still an important administrative area of the city today. The military garrison area, centered on the elite barracks of Manchu city, made Taiyuan's southwestern and northeastern urban areas an important military space. In addition, due to the need to construct the Eight Banners Manchu city and Green Earthen City, many residents and merchants had their properties requisitioned for military use, forcing them to move to the surrounding areas. Because the area from Great South Gate Street to Willow Lane was a traditional trade area and there was a huge consumer population in its vicinity, many of the commercial operators who were moved out spontaneously moved to the area around Willow Lane, thus making the commercial layout of Taiyuan more concentrated and also making the Willow Lane commercial area take shape [1] (Fig. 2).

The modern industry began to develop in the late Qing Dynasty, except for the old Manchu city, which was relocated due to the destruction of the city by floods. It was mostly around the emergence and development of modern industry and railway transport, with the main focus on the new economic and transport sectors. With the rapid development of the modern railway in Taiyuan at the end of the Qing Dynasty and the shift of the city's transportation from center to the east, commercial activities in the city began to shift to the southeast of the city, and the streets between Liu Xiang and Xin Nan

Men Station and their vicinity rapidly became commercial markets and busy areas. With its prime location and potential consumer market, Willow Lane was able to further develop into a commercial center with a large number of merchants from all over the city, a wide variety of goods, and a full range of commercial functions (Fig. 2).

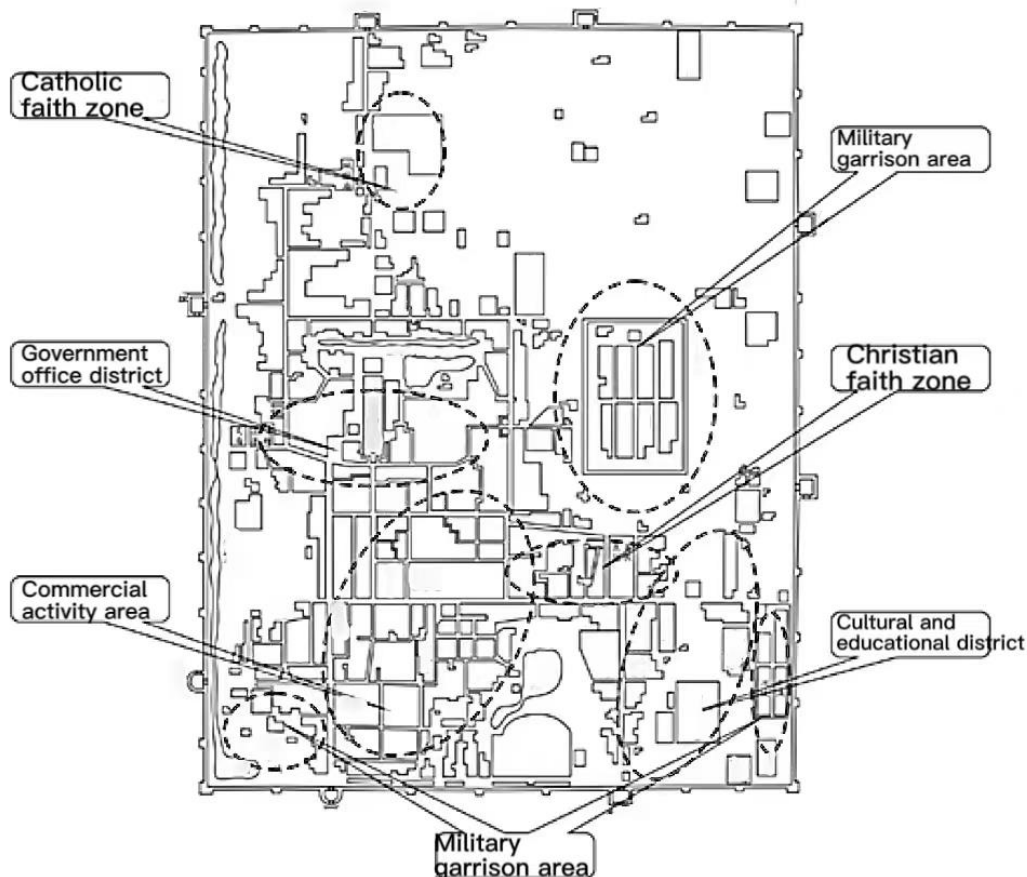


Fig. 2 Diagram of the spatial layout of the urban area of Taiyuan during the Qing Dynasty

3.3. The Civil War

After the Revolution of 1911, Taiyuan's urban development gradually entered its most active period in modern history, becoming the province's central city for education and culture, transportation networks, industry and commerce, and water and forestry, with local autonomy becoming more effective each passing day. Regional planning evolved from the individual construction system. The Ten-Year Construction Plan of Taiyuan, the city's initial urban development strategy, was introduced in 1932. This plan was not merely for urban planning for the city but for the growth of the city that integrated the whole concept of social planning and development into the city and its architecture, reflecting the convergence of Western urban planning theory and traditional Chinese culture. Taiyuan had an inseparable geographical relationship with Shanxi, and the transformation and evolution of the modern city was a microcosm of local autonomy in Shanxi, with certain representative and typical features.

Between 1912 and 1937, Taiyuan's modernization gradually improved, absorbing advanced Western ideas and developing innovations independently. This led to the city's development, which peaked in the 1930s before the founding of New China, and paved the way for a series of management systems and modernized ways of developing pluralism.

During this period, due to the spread of western concepts and ideas of urban construction, many parks and other spaces with public attributes also sprang up in Taiyuan, such as Fu Gong Ancestral Hall and Wen Ying Park. For example, the Fu Gong Ancestral Hall was a garden building to

commemorate the famous person Fu Shan in Taiyuan, reflecting the importance the rulers attached to the construction of culture and education. The commemorative building was no longer limited to the single design of the ancestral hall building in terms of building site selection, general layout, overall scale, and the design of the building monoliths. Instead, these buildings incorporated Chinese garden art, museum viewing, administrative building offices, etc. This diverse functional composition of the building formed an undulating sequence of buildings, giving more spiritual and practical value to the commemorative building [1,3].

3.4. After the founding of New China

3.4.1 Before the reform and opening up

After the founding of New China, Taiyuan was one of the key heavy industrial bases to be built within China's first and second five-year plans. The First Five-Year Plan was prepared in 1954, based on the manuscript sketches by Soviet experts Kravchuk and Balagin, drawing on the discussion of the Draft Outline of Urban Construction for Taiyuan by Liang Sicheng, Head of the Department of Civil Engineering at Tsinghua University.

In terms of the economy, four industrial zones were planned: the North Industrial Zone, the North Suburban Industrial Zone, the North Industrial Zone in the west of the river, and the South Industrial Zone in the west of the river. In terms of population, there were three broad sections: the Hexi residential area, the Hedong residential area, and the northern suburban residential area. A protective green belt separated the residential areas from the industrial ones. In spatial and social terms, the road system was planned in a chessboard layout. In detail, the city center was the east bank of the Fen River in the southwest near the old city. The main axis was the connection line from the bus station, the city center, to the cultural palace in the west of the river, which is now Yingze Street. The secondary axis was the connection line from the cultural rest park in the southern suburbs, the city center to the steel mill and the residential area in the northern suburbs, which is now Xinjian Road. High-rise buildings were built on both sides of the main and secondary axes. The Fen River was the center of the urban green system, combined with parks, green spaces, and boulevards. The planned urban area included basic industrial, service industrial, warehouse land, railway, and residential lands, with 81.6 square kilometres and a per capita area of 101.99 square metres.

3.4.2 From reform and opening up to the present

After the reform and opening up, to adapt to the new situation and solve the two problems of "serious water shortage" and "serious pollution" that had been revealed in the city's development. Taiyuan underwent a new planning process, with a reduced proportion of industry and transport compared to the First Five-Year Plan. The city became the capital of Shanxi Province, the center of science, technology, culture and education of the province, a city of heavy industry with a focus on chemicals, coal, machinery and metallurgy, and a center of scientific and technological research for the development and comprehensive use of coal in the province. By this time, Taiyuan was a mega-city with a population of over a million.

In terms of space, the urban structure had changed from the single center of the First Five-Year Plan to a multi-center structure, dividing the city into nine clusters according to the existing functional divisions and natural river gorges. The arterial roads linked each cluster and the city center. The city's roads were divided into four levels: traffic arteries, lifestyle arteries, residential roads, and subdistrict roads. Yingze Street was the absolute main axis of the city, with the Hexi section to Xishan Mining Bureau. The green area was centered on Fen River, with 11 Shahe green belts in the east and west as the branch, connecting two mountains in the east and west and 3 scenic spots including Juwei Mountain, Jinci Temple, and Shuangta Temple, and combined with 28 parks and various small amusement parks and avenues in the city.

In terms of the economy, the city's commercial service center was based on the traditional Zhonglou Street and Willow Lane Commercial Street. The city's large public buildings were centered

on Yingze Street. On the other hand, industry relied on tapping the potential, reform, renewal, and renovation to increase its capacity on the existing basis [5].

In terms of the social, the transport system had been fully upgraded, with 6,181 kilometres of roads, including 222 kilometres of motorways. The culture was spread wider, with 3 radio and television stations, 11 comprehensive national archives, 12 museums, 12 cultural centers, and 14 performance groups. The public health care system had been improved, with a total of 2,527 health institutions [5,6].

4. Influence factors of urban planning and spatial evolution

4.1. The influence of politics on the evolution of urban space

Due to the long history of the city of Taiyuan, the political contexts and needs determined the basic planning of the city [7,8].

The construction of Taiyuan in the Ming dynasty was driven by Zhu Yuanzhang's request to "use the new city of Taiyuan for Jin", and was subject to the strict rituals of the Chinese tradition. One of the unusual features of the city was the construction of the Tribute Hall in the early Ming Dynasty to cater to the imperial examinations in Shanxi. Behind Wenying Lake, its landscape function can be reflected, laying the foundation for developing public space in the surrounding area in later times.

The "inner adjustment" and "outer expansion" of the urban layout of Taiyuan in the Qing dynasty led to the further improvement and development of Taiyuan's urban functional areas based on the Ming dynasty. It also exhibited a trend towards concentration and specialization, laying the foundation for developing and evolving Taiyuan's urban functional areas in later times. During the Qing dynasty, the construction and functionality of the city continued to be dominated by traditional political and military functions.

In modern times, as new ideas were introduced and the needs of the people became more and more numerous, Taiyuan in the Republic of China had 4 cinemas, 1 higher school, 12 secondary schools, 668 primary schools, and 12 hospitals. However, due to war and other reasons, the city of Taiyuan was full of bunkers and rubbish, closed factories, and depressed commerce. Therefore, it is difficult for people to live with incomplete infrastructure.

4.2. Ideas and theories of urban planning

In addition to the influence of the political context, urban planning theories from different periods refined the layout of the city of Taiyuan.

The city layout of Taiyuan in the Ming dynasty was based on the idea of the palace as the main planning of the royal city. With the palace of the Emperor of Jin as the center of the city, there was a clear axis of symmetry and a clear left-right echoing pulse. At the same time, although the idea of ritual dominated the planning of the city, the strict adherence to the concept of 'ritual' encountered many problems and contradictions in practice, which led to the emergence of 'anti-ritual' ideas for the construction of the city based on practical experience. For example, the Jin Palace in Taiyuan was not strictly in the city's center, instead using "Ding in the Chinese word" street layout.

It was not until the early twentieth century that China introduced two major theories and ideas of foreign urban construction and management: the "primary" urban planning ideas and theories of Europe and America, and the "secondary" urban planning ideas and theories of Japanese transformation. The Ten-Year Construction Plan of the People's Government of Shanxi Province was launched based on above theories, and Taiyuan was divided into: educational, commercial, residential, industrial, forestation, and scenic areas, strengthening the planning and control of land use.

During the Republican period, Yan Xishan created a system of local self-government with the concept of "village politics" in a relatively stable political environment where the military and government of Shanxi were unified and independent administrative regions were formed. The urban development of Taiyuan thus entered a prosperous period, becoming the center of the province's education and culture, transport network, industry and commerce, and water and forestry.

Later, as Japan invaded North China, the Imperial Japanese Land Survey Department mapped the entire area around Taiyuan in 1938 and produced the “Taiyuan Topographical Survey Map”. In August 1938, the pseudo-North China Construction Bureau prepared the "Outline of the Taiyuan Metropolitan Plan", which adopted the whole set of modern urban planning theories, methods, and steps, reflecting the ideas and application of modern Western urbanism [9].

4.3. Culture and education

Since the Ming and Qing dynasties, culture and education also influenced the spatial planning of Taiyuan city. For example, in the early Ming Dynasty, to meet the growing number of imperial examinations, the city of Taiyuan was built as a tribute courtyard to be used exclusively for imperial examinations.

After the Qing government introduced educational reform measures, various types of new government-run schools emerged rapidly, such as university halls, professional halls, teacher training halls, and small halls. The distribution is characterized by the spatial agglomeration effect of the city's southeastern corner as a cultural and educational function area, showing a trend towards specialization and concentration. The city's southwestern corner was once a military training ground in the early Qing Dynasty, where various military-related schools were concentrated in the late Qing Dynasty.

After the Republic of China, many spaces of cultural and educational significance were established in the city of Taiyuan. The Fu Gong Ancestral Hall, for example, was built to incorporate the concept of humanistic edification into the city's physical space, forming a historical and cultural spatial gene with local characteristics and leading the overall order of the city. After its completion, the Fu Gong Ancestral Hall established a cultural and educational landmark within the territory and boosted the layout. Subsequently, various schools, libraries, and ancestral temples have been built in Taiyuan City, creating numerous cultural and educational facilities listed in the city's layout to bear the culture [10].

5. Conclusion

This paper describes the historical background of Taiyuan and the evolution of urban space and discusses its relationship with politics and culture.

The spatial layout of Taiyuan in the Ming dynasty was based on the idea of the palace as the main part of the royal city planning, emphasizing the role of the palace of the Emperor of Jin as the main part of the city's approximate medial axis, forming a political spatial layout of 'one belt (political belt) and two districts (official and royal districts). On the other hand, the original plan of the old city of the Song dynasty was used and combined with the topography to create irregular streets to meet the needs of the rulers. During the Qing dynasty, Taiyuan's walls were still used, and the overall framework of the city changed little, with the spatial layout changed with the reconstruction activities. During the Republican period, Taiyuan's urban development gradually entered its most prosperous period since modern times, becoming the province's central city for education and culture, transport networks, industry and commerce, and water and forestry, with spatial planning influenced by Western urban planning ideas. After the founding of New China, Taiyuan became a city of heavy industry with a focus on chemicals, coal, machinery, and metallurgy and a center for scientific and technological research in the development and comprehensive use of coal in Shanxi Province.

The political context, planning theory and educational culture mainly influenced the spatial planning of the city of Taiyuan. During the Ming and Qing dynasties, the layout of the city was mainly influenced by the idea of planning the royal city with the palace as the main focus, and the city was built serving traditional politics and military affairs with relevant facilities and buildings. From the Republican period to the present, the city's layout has been influenced by Western urban planning ideas, and the functionality of the internal architecture has become more comprehensive, with the establishment of many spaces of living, cultural, and educational significance.

References

- [1] Jia Fuqiang, A Study on Urban Space Evolution of Taiyuan During Ming and Qing Dynasties. M.D. Thesis, Northwest University, 2015
- [2] Wang P, Gao J. Research on the Open Space in Urban Areas of Taiyuan. In 2nd International Conference on Electronic & Mechanical Engineering and Information Technology, Atlantis Press. 2012: 487-490.
- [3] Li Lan, A Study on the History of Modern Taiyuan Test Planning and Construction (1881-1949). PhD. Thesis, Xi'an University of Architecture and Technology, 2020
- [4] Zheng J, Wang JP. Brief Analysis of Settlement Patterns in Taiyuan County in Ming Dynasty. In Applied Mechanics and Materials. Trans Tech Publications Ltd. 2014, 477: 1152-1155.
- [5] Liu Rutong, Study on the urbanization process in Taiyuan, M.D. thesis, Taiyuan University of Technology, 2017
- [6] Huaizhi T, Kening W, Min T. Research on regional function division of land use in Taiyuan City. In 2010 International Conference on Electronics and Information Engineering. IEEE. 2010, 2: V2-283.
- [7] Mao Yu, Chai Zonggang: Exploring the Influencing Factors of Urban Planning. School of Architecture and Urban Planning, Lanzhou Jiaotong University Beauty and Times (Urban Edition), 2016
- [8] Chen X. Consideration on the urban spatial morphology and operation of Taiyuan, China from the religious building perspective. *Frontiers of Architectural Research*. 2022, 11(2):239-54.
- [9] Cui Jingming, Study on the Development of Modern Urban Construction in Taiyuan in Historical Perspective Art and Design (Theory). 2021
- [10] Gaubatz P, Hanink D. Learning from Taiyuan: Chinese cities as urban sustainability laboratories. *Geography and Sustainability*. 2020, 1(2):118-26.