The Evolution Games and Sustainable Development of Shijiazhuang Railway Station Hub and Its Surrounding Urban Space

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Abstract

The Zhengding-Taiyuan Railway was completed and opened to traffic in 1907. It is the first state-owned narrow gauge railway in modern China. By combing the historical background and important status quo remains of the Zhengding-Taiyuan Railway, this paper investigates the development process of the railway itself and the evolution of surrounding cities and towns, and observes the role of the Zhengding-Taiyuan Railway in promoting the economic and social development of the railway radiation area. Taking Shijiazhuang section as an example, this paper analyzes the evolutionary games between Zhengding-Taiyuan Railway and its radiation zone in Shijiazhuang in terms of industrial form, trade distribution, transportation hub, etc. What's more , this paper discusses the continuous influences and social benefits of the Zhengding-Taiyuan Railway remains in Shijiazhuang under the current urban renewal state, and puts forward suggestions for the protection research and sustainable reuse of the remains in the future.

Keywords: Industrial Heritage; Urban Renewal; Evolution Games; Sustainable Utilization; Zhengding-Taiyuan Railway; Shijiazhuang Railway Station Hub

1. Background

Zhengding-Taiyuan Railway is the first railway in Shanxi Province and the symbol of beginning in Shijiazhuang city in China. The Chinese actually participated in the design and measurement of Zhengding-Taiyuan Railway, undertook the construction of bridge tunnels and all auxiliary buildings along the line.

In order to make use of coal and iron in Shanxi and export its rich mineral resources, the Chinese government signed a contract with Russia in 1902 to build the Zhengding-Taiyuan Railway. The contract then transferred to France. In May 1904, the construction of the Zhengding-Taiyuan Railway began and then was completed in December 1907. In order to reduce the construction cost and speed up the construction, the French side built it into a narrow gauge railway with a gauge of only 1 meter and laid light rail. In November 1937, the Japanese army occupied the Zhengding-Taiyuan Railway. Due to the low volume of narrow gauge transportation of the Zhengding-Taiyuan Railway, Japanese army changed it into a standard gauge (1435mm) and formed a railway network. The name of Zhengding-Taiyuan Railway was changed to Shijiazhuang-Taiyuan Railway. In 1947, when Shijiazhuang was liberated, the Chinese government invested a lot of money to carry out comprehensive rectification and the double track technical transformation of the railway. In 1974, in order to further increase the operation volume of Shijiazhuang-Taiyuan Railway, the government decided to transform it into an electrified railway, which was the first double line electrified railway in China. Shijiazhuang terminal project was introduced. In 2005, due to the increasing passenger flow and logistics, the Shijiazhuang-Taiyuan railway entered the state of overload operation. The government started to build a new Shijiazhuang-Taiyuan Passenger Dedicated Line, which was completed and opened to traffic in 2009. The operation volume of the original Shijiazhuang-Taiyuan railway

had been greatly reduced, leaving only two pairs of normal speed trains. The new Shijiazhuang-Taiyuan Passenger Dedicated Line is also the earliest high-speed railway in China, opening the high-speed railway era.

2. Industrial heritages along the Zhengding-Taiyuan Railway

In 2019, Zhengding-Taiyuan Railway was listed in the inventory of Chinese industrial heritage protection (the second batch). The main industrial heritages included in the list are: (Shanxi) Yangquan Station, Nanzhangcun Station, Shangan Station, Nanyu Station, Niangziguan Station, Mianhe Bridge, Faluling Railway Bridge ; (Hebei) Completion Monument of Zhengding-Taiyuan Railway, Maohua Memorial Pavilion, Shijiazhuang Stone Bridge, Zhengtai Hotel, Japanese Blockhouse, map and archives, etc. The important industrial heritages along the Zhengding-Taiyuan Railway are summarized as follows.（Table 1）

Table 1. Important industrial heritages of Zhengding-Taiyuan Railway (Source: drawn by author)

Name	Year	Builder	Usage State	Original Appearance	Present Situation
Mianhe Bridge	1905	France	In Use		
Faluling Railway Bridge	1905	France	In Use		
Niangziguan Station	1906	France	In Use		
Yangquan Station	1906	France	Vacant		
Shijiazhuang Stone Bridge	1907	China	Vacant		
Zhengtai Hotel	1907	France	Vacant		

3. Spatial evolution of Shijiazhuang station hub and its surrounding urban environment

The Zhengding-Taiyuan Railway connects Shanxi and Hebei and transports the rich products along the railway to the Beijing-Hankou Railway, which changes the backwardness of the towns along the line. Especially in Shijiazhuang, the Zhengding-Taiyuan Railway is a narrow gauge (1000mm gauge), while the Beijing-Hankou Railway is a standard gauge (1435mm gauge), so it is necessary to change vehicles in Shijiazhuang, which can greatly promote the development of logistics and freight transportation. The form of Shijiazhuang railway hub and the city is unique in China. There is no foundation around it. It starts from scratch and is also called 'the city pulled by the railway'.

3.1 Modern urban spatial evolution of Shijiazhuang station hub (1904-1949)

Before 1904, Shijiazhuang was a small village in Zhili Province. In 1904, the Beijing-Hankou Railway was opened to traffic and a station was set up in Shijiazhuang. In 1907, the Zhengding-Taiyuan Railway was completed, which met with Beijing-Hankou Railway in Shijiazhuang, forming a railway hub. At the same location, the wide and narrow tracks were independent of each other, and two stations coexisted for a long time. The spatial structure of the hub took the Beijing-Hankou Railway as the vertical axis, extending to the north and south directions, in a long strip shape. The south end of the Zhengding-Taiyuan Railway was parallel to the Beijing-Hankou Railway, while the land occupied by two railways was gradually widened to the north. The two stations were sandwiched between the two railways, forming a closed hub space, which was inconvenient to enter and exit the platform. In order to facilitate the crossing, Shijiazhuang Stone Bridge of Zhengding-Taiyuan Railway was built, which became the first railway stone arch bridge connecting the East and West urban areas of Shijiazhuang at that time.

After the Japanese army occupied North China, in October 1939, Shimen (the old name of Shijiazhuang) city planning outline was formulated. In 1940, Japanese army changed the narrow gauge to the standard gauge to increase the operation volume, and the function of Shijiazhuang Stone Bridge no longer existed when the railway went out from the south side of the station. At the same time, it is planned to merge the Beijing-Hankou Railway station and the Zhengding-Taiyuan Railway station into one station, named Shimen station, with the west exit. Between the west side of the station and Shijiazhuang Stone Bridge, a front square and a city park were built, presenting a radial road network. Railway factories and power plants were built around the station, and the central urban area was basically industrial land, commercial land and storage land, forming the prototype of Shijiazhuang's contemporary urban pattern.

Urban development and railway system are interactive and symbiotic, but when cities or hubs develop to a certain scale, they will also restrict each other. On the one hand, urban development restricts the development of railway hub. On the other hand, railway hub area forms a huge independent space in the city, which leads to the separation of urban layout. This separation is also accompanied by the urban development, can be more and more, which will limit the development of urban environment and traffic.

3.2 Contemporary urban spatial planning pattern of Shijiazhuang railway station (1949-2020)

After 1949, Shijiazhuang newly built and expanded power, coal, textile and other industrial enterprises. The formation of industrial enterprises laid the foundation for the urban development of Shijiazhuang. In 1968, the capital of Hebei Province moved in, and the administrative center settled in the east of the city. According to the draft urban planning of Shijiazhuang City in 1952 and the overall planning of Shijiazhuang City (1955-1975), due to the constraints of railway and the restriction of the northwest, the urban pattern of Shijiazhuang city growed to the east on a large scale. Administrative areas and new industrial areas were located in the east side of railway hub, and a large number of residential areas and school districts were planned. However, the nature of the old urban land for the hub were still mainly existing industry, commerce, storage, etc. to the west of the railway hub. It was necessary to reconstruct gradually and expand slightly to fill in the blank, but basically not develop in order to make full use of the existing facilities.

In 1981, the planning continued to expand on the basis of the planning in 1955. It is different from the planning in 1955, which only reconstructed

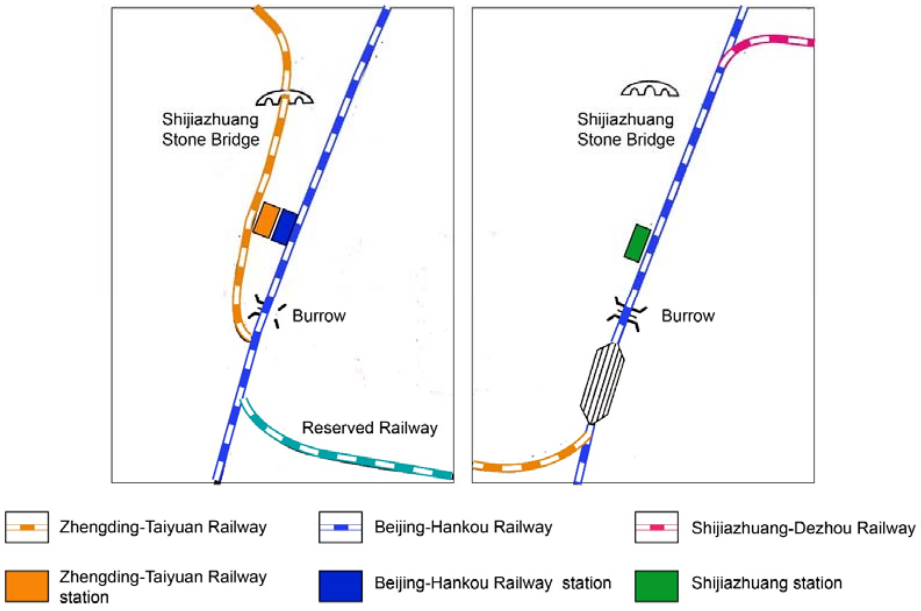

Figure 1. This is the schematic diagram of outgoing line changes of Shijiazhuang railway terminal before and after 1940.

Figure 2. This is the Planning drawings of Shijiazhuang city from 1902 to 1949.

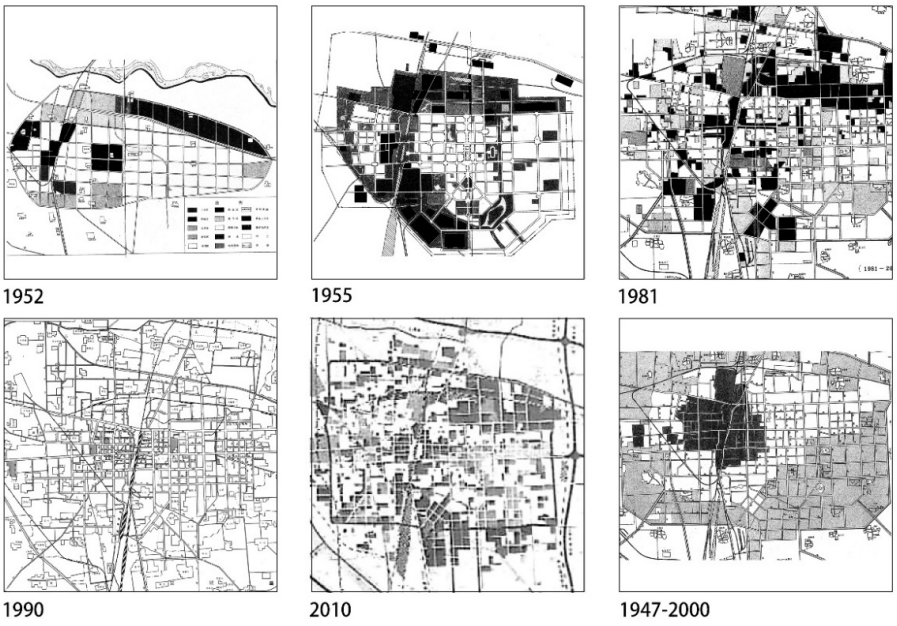

Figure 3. This is the Planning drawings of Shijiazhuang city from 1952 to 2010.

and supplemented the west side of the railway hub. In 1981, the southwest urban area was also expanded to some extent, but on the whole, it was still dominated by the development of the southeast of the city. At this time, the triangle-shaped railway hub which was formed by the three lines of Zhengding-Taiyuan Railway, Beijing-Hankou Railway and Shijiazhuang-Dezhou Railway had been surrounded by the new urban area from the outside. The north-south direction of the urban area was penetrated by the Beijing-Hankou Railway. The east-west direction took Zhongshan Road as the main axis, the railway hub as the origin, and extended to the east and west sides. In 1981, the planning put forward the concepts of protecting ancient buildings, sites and cultural relics, and began to pay attention to the protection of sites and relics along the Zhengding-Taiyuan Railway in the hub area. Shijiazhuang Stone Bridge and Zhengtai Hotel were successively listed as provincial and municipal cultural relics protection units. In 1984, Shijiazhuang new railway station project began, the original station was demolished, and officially put into use in 1987, that is, today's old Shijiazhuang station located in Zhongshan Road.

In 2012, Shijiazhuang new passenger station began to open. The new passenger station is located in the south of 1984 old railway station. The old station was stopped and transformed into Shijiazhuang Railway Museum. The original square in front of the station was renamed as Liberation Square, and the tracks in the station were preserved as they were. At this point, the railway hub no longer has the original function and faces transformation.

Shijiazhuang City Master Plan (2011-2020) proposes to improve the function of passenger and freight transport of railway hub, and thoroughly solve the problems that freight disturbs the city and railway divides the city for a long time. For the outstanding modern public buildings, industrial buildings and traffic buildings left after the transformation of the railway hub, the planning will protect them as the historical landscape area, build the Zhengtai square, the historical characteristic block and the industrial heritage park.

4. Urban public interest and sustainable utilization of Shijiazhuang hub remains

Although Zhengtai Hotel and Shijiazhuang Stone Bridge are listed in the cultural protection unit, they have not attracted enough attention. At present, the two remains are enclosed by walls, and there are a large number of vacant bases

around, which are currently used for parking lot. Shijiazhuang has set up a special management organization to plan for the construction of Shijiazhuang historical and cultural square based on the Shijiazhuang Stone Bridge, the monument to the liberation of Shijiazhuang and Zhengtai hotel, but the plan has not yet been implemented.

In this regard, the sustainable reuse of industrial heritage should be emphasized. The holistic process of sustainability might be described by the four values:

- Futurity - relating to the long-termism, durability, thinking about the next generation;
- Environmental protection - comprising the use ofnonrenewable resources, natural capability of waste absorption and biodiversity;
- Quality of life - linking to community, cultural and social well-being (not just material wealth);
- Equity - community empowerment participation, fairness and sharing.

According to the four indicators of sustainable development, the action plan suggests the following advices:

- Establish heritage databases, mature protection systems and good practice guides;
- Emphasize on the sustainable community concept and public participation;
- Respect industrial history and create future space;
- Focus on the driving role of the overall regional sustainable development;
- Strengthen the real-time monitoring and evaluation in the later stage.

5. Conclusion

Zhengding-Taiyuan Railway has driven the development of surrounding cities and towns in a certain period of time. Shijiazhuang is also rising because of Zhengding-Taiyuan Railway. At present, although some sections are still open to traffic, most of the routes have been changed, and the operation volume of the Zhengding-Taiyuan Railway has been greatly reduced. Many industrial buildings along the railway are also in the state of being abandoned or vacant, but their social benefits and historical value should be discussed. Based on the experience of similar railway heritages at home and abroad, sustainable development suggestions are given, such as: integrating the industrial landscape of Zhengding-Taiyuan Railway; establishing the industrial landscape historical park; establishing the industrial ecological museum and retaining the original industrial scene; paying attention to the overall protection of industrial towns and industrial areas.

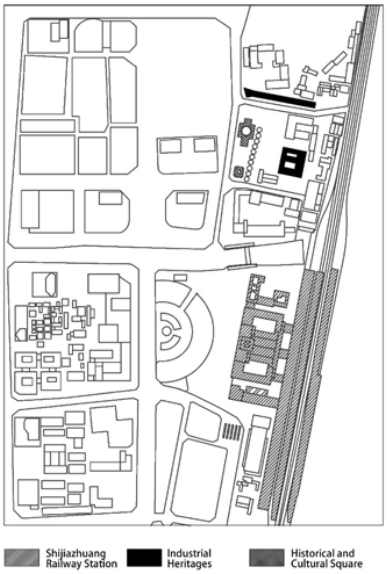

Figure 4. This is the current map of Shijiazhuang railway hub.

Endnotes

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