Exploration of Railway Heritage Renewal Method under the High Line Park Mode——Taking the High Line Park in New York as an example

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Abstract: As an extremely successful case in the renewal of railway heritage, New York High Line Park has aroused the research of many scholars at home and abroad. This paper analyzes and compares a large number of existing cases to classify the existing railway heritage renewal models, and summarize the internal application characteristics and external manifestations of various models. Through the analysis of the common points in the design methods of the New York High Line Park, a representative case of railway heritage transformation, the three functional characteristics of the high line park renewal model are refined, and the combination mode of materials in the actual project and its use are discussed. Functional evaluation summarizes the modular methods of project transformation with the same internal factors, and proposes feasible transformation models. It is of reference significance for future Chinese railway heritage reconstruction projects.

1. Introduction
The railway heritage renewal method represented by the high-line park model is a method of revitalization and renewal of the old railways in the central area of the city. It responds to the railways that were built in the process of urban development but gradually eliminated due to economic development and technological progress. In the process of urban renewal, how to preserve the original memory of places and the material and spiritual remains of the industrial age and bring them back to the life of modern cities has always been the most important issue in the field of heritage renewal. The renovation and renewal mode of the High Line Park focuses on "connection", pulling the railway heritage from history to reality through various ways with the city, nature, and the public, and re-enter the public view with a new and modern look, and create a new city memory.
2. Railway Heritage Renewal and High Line Park Model

2.1. Concept and Connotation of Railway Heritage Renewal

According to the classification of The International Conference on the Conservation of the Industrial Heritage (TICCIH), the railway heritage belongs to the category of industrial heritage, which includes all the facilities and equipment of the railway project (civil engineering facilities, railway construction and small items, mechanical facilities, signal equipment, steam locomotive maintenance warehouse) and the spiritual and material remains solidified on it. With the development of cities and the economy, changes in regional traffic patterns and improvements in science and technology, the railway itself has been upgraded, which has caused some railway facilities to be difficult to perform in their previous transportation functions and were abandoned by the city over time. And its unique linear spatial characteristics and the historical culture it carries constitute the connotation of railway heritage[1].

2.2. Features of High Line Park Model

Summarizing the existing case models of the renewal of foreign railway heritage, according to the location of the railway, the length of the remaining line, the current status of its own remains, the surrounding resources and needs, the railway heritage has two renewal directions: 1) Combining with tourism; 2) Combined with public life (Table 1), among which the characteristics of the transformation model represented by the high-line park are particularly prominent.

The core of the high-line park reconstruction model lies in "connection": 1) Create a convenient and pure walking system through the existing viaduct, connecting various blocks and buildings in the air; 2) Through the selective preservation of the natural ecology restored due to long-term desolation a secondary landscape design is also added to combine natural landscapes with industrial landscapes, connecting the city and nature; 3) By providing rich and interesting public service facilities, combining entertainment life with urban landscapes and connecting the public’s social space. To a certain extent, the transformation of the High Line Park not only created a unique linear landmark for the city, but also created a pedestrian system, outdoor gardens and public event spaces for the city. It not only connects the various functional districts of the city, but also assumes the function of urban public open space. At the same time, it also provides an excellent case for the transformation of the short-distance elevated railway heritage of other urban centers with similar conditions.

| Direction with tourism development | Mode | Features | Representative case |
|----------------------------------|------|----------|---------------------|
| Integration                      | Theme park | Urban area; Outstanding resource advantage | Triangle Park, Berlin, Germany |
|                                  |       |          | Südgelände Nature Park, Berlin, Germany |
|                                  |       |          | Greenway of Xiamen Railway Cultural Park |
| Sightseeing route                | Suburbs; The surrounding natural resources are rich | Sagano Railway |
|                                  |       |          | China Taiwan Alishan Forest Railway Pingxi Line |
|                                  |       |          | Guangxi Heshan Shili Flower Corridor |
| Integration with public life     | Cultural route | Long span Profound cultural resources | China Yunnan-Vietnam Railway |
|                                  |       |          | China Jiaoji Railway |
|                                  |       |          | China Middle East Railway |
| Green corridor                  | Urban area Bring natural scenery to | Promenade Plantée, Paris, France |
|                                  |       |          | La Petite Ceinture, Paris, France |
|                                  |       |          | Green Corridor in Tianjin, China |
| Hiking route   | American Rails-to-Trails series transformation |
|---------------|-----------------------------------------------|
| Suburbs;      | Central Otago Railway Greenway, New Zealand   |
| Bring outdoor |                                               |
| leisure space |                                               |
| to the city   |                                               |
| High Line Park| The High Line, New York, the United States     |
| Urban area    | 7017, Seoul-ro, South Korea                    |
| Bring public  |                                               |
| social space  |                                               |
| to the city   |                                               |

### 3. New York High Line

#### 3.1. Project Overview

In 1930, a 48.3-kilometer-long freight dedicated railway line connected the 34th Street Hudson Port and the Meat Processing District. It used an elevated form to directly connect factories and warehouses at a height of 9 meters. The upper floor allows trains to directly transport materials or finished products into the factory. This railway was once regarded as the "traffic lifeline" of New York's industrial area. It was gradually abandoned in 1980 and faced demolition[2]. After nearly 30 years of being abandoned, the New York non-profit organization "Friends of the High Line (FHL)" has gone through a lot of efforts to unite the government, designers and the public to transform it into a landmark sky garden corridor in New York. The 2.33-kilometer-long abandoned railway branch line was constructed in three phases, which not only successfully transformed into a multi-disciplinary "living system" combining landscape design, urban design and ecology, stimulated real estate development in neighboring communities, and successfully inspired others district, redesign and develop outdated infrastructure into public space.

#### 3.2. Summary of design points

1. Connecting cities
   1) Safe and convenient pedestrian system: the average height of the New York High Line Park is 9 meters above the ground, which effectively guarantees the traffic safety of the park's road surface. It spans 22 blocks and crosses the 4 building from the second-story overhead floor (due to private ownership issues cannot provide direct access). 12 of the blocks have an entrance connected to the High Line Park, and the entire park is equipped with complete barrier-free access roads. This design pays more attention to the level of mobility, forming a new pedestrian network and connecting the surrounding communities, giving visitors a new immersive surreal experience of wandering the wild roads, deepening and far away from the city, giving public observation another perspective of the urban landscape also provides the people of New York with a new perspective to observe the Hudson River and to check in Vessel, the new landmark of New York's Hudson Yards.
   2) Track preservation method combined with historical elements: in the treatment of the ground paving of the viaduct, the renovation project continued the historical context of the elevated railway, retained the original position of the rail, and used new sleepers, ballasts, gravel, and roadbed industries. The elements are re-laid and combined with the new strip-shaped concrete slab paving system to create two typical rail retention methods: 1) the rail is flush with the pedestrian pavement; 2) the rail is juxtaposed with the pedestrian pavement. The coexistence of old-style rails and modern elements creates a modern open space with great creativity and inspiration.

2. Connect with nature
   1) Complex and diverse plant selection: After nearly 30 years of being abandoned, this once important urban public infrastructure has gradually been covered by volunteer plants. The rich plant species attracts a large number of birds, insects, etc. Biology is also one of the driving forces to attract
a large number of influential people to actively advocate the protection of the high line and redevelop it into a citizen park. After the transformation, the High Line Park selectively retains the native meadow vegetation in the site, and extends it into a rich combination of plant landscape forms represented by woods, grasslands, bushes, lawns and wild flowers[3]. As of the end of 2016, there are about 400 species of plants growing in the High Line Park, of which 161 are native plants of the High Line[4]. Such a large number of plant species bring rich dynamics to the plant landscape of the High Line Park. This "full-time" landscape design creates a plant landscape that alternates in four seasons and cyclically rotates, directly connecting the natural landscape into the urban landscape, and providing a unique taste of artificial and natural harmony.

2) Hard paving and soft planting interpenetrate each other: The landscape design team of the High Line Park put forward the concept of "planting-building", which intertwined plants and ground tiles. The ground texture that is spliced and laid on the basis of strip-shaped concrete slabs is designed. The joints between the strip-shaped concrete slabs are open, and the joints are specially designed to be tapered. Plants grow from the gradually tightening gaps and become natural[5]. Then use the "matrix" concept, that is, the dominant plant clusters are arranged in a matrix, which fits the distribution law of rails and sleepers, effectively avoids trampling, protects the growth of plants, and makes it easier to achieve a relatively stable landscape effect[6]. In order to achieve a rich landscape space level and background effect, the designer chose a large number of light and moderately dense plants that give people a translucent effect as the background to fill the gap between the flowers and stems, using this method to achieve virtual reality the combined effect.

3) Connect with the public

1) Creation of node space: In the 2.3-kilometer-long promenade, the High Line Park creates a thematic node space and places diversified public activities to attract urban people and activate the vitality of the region. For example, the High Line Park has an audio-visual broadcasting station on the overhead floor of the building between 14th and 15th Streets, and outdoor video programs are played every evening; outdoor food is set up on the overhead floor of the former National Biscuit Company between 15th and 16th Streets Plaza; set up a stepped plaza and an observatory on 17th Street, where the open-air theater can provide a place for public performances and the best viewing location; on the original elevated environment on 25th Street, another high 2.4 meter walking path maintains the original terrain undulations and allows the plants on the ground to grow freely, while visitors walk under the dense tree porch; the viewing platform on the 26th street is set outside the viewing platform.

4. Conclusions
The renewal case of the High Line Park in New York tells us: an excellent railway heritage renewal case is a linker of urban context, a preserver of history and culture, a creator of natural landscapes, and a bearer of public life. This kind of design concept that takes its own rich connotation as the core and combines the characteristics of the city to continuously develop urban public living spaces is completely possible to achieve a win-win situation at the two levels of heritage renewal and urban development.

China's planning management department should be good at discovering the potential for the transformation of abandoned railways. It should take into account the urban development process, count the abandoned railways in the city and set standards for classification, select the railway heritage with the potential to develop into urban parks, and find a suitable design team, to sort out its current value and find the possibility of future development. All parties work together to find an optimal solution that can properly transform the railway heritage and bring economic benefits to the city and serve the masses.

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