

Case Study Report

The path to improve the quality of public space in industrial parks under the concept of sharing

Take Taiyuan Starting Area of Xiaohe Industrial Park, Shanxi's Transformation Comprehensive Reform Demonstration Zone as an example

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Abstract

Since the 1980s, the Chinese government has established various types of industrial parks, which have become important carriers of local economic development. In the period of rapid urbanization in China, many industrial parks are guided by the land demand of enterprises and take the path of scale expansion, which neglected the shaping of public space, resulting in the phenomenon of "emphasizing production but neglecting cities and people", which is not conducive to the sustainable development of industrial parks. As China's economy enters the stage of high-quality development, industrial parks will also pay more attention to the improvement of space and environmental quality. Under this background, it is urgent to sort out the relationship among "industry, city, and people" and explores the planning method of industrial park in space creation and landscape environment design, in order to promote the formation of intensive, efficient, quality and lovely public spaces in the industrial park.

According to the concept of sharing, this article summarizes the successful experience of space creation and landscape environment design in industrial parks in China and around the world through literature review and case study analysis. Combining with the planning practice of the Taiyuan Starting Area of Xiaohe Industrial Park, Shanxi's Transformation Comprehensive Reform Demonstration Zone, the article summarizes the planning strategy for improving the quality of public space in the industrial park.

As China's economy shifts from a stage of rapid development to high-quality development, industrial parks will pay more attention to their construction quality. The research found that organizing industrial park space and landscape environment design with a shared concept can greatly improve the efficiency of public space use and promote the formation of a vibrant and diverse charming space, which can play a reference and guiding significance for industrial park planning in the context of China's economic transformation and development.

Keywords

Industrial Park, shared, public space, environmental quality

1. Introduction

Industrial parks play an important role in China's economic development and strongly support the rapid economic growth of various cities. However, at the same time of rapid development, some industrial parks have inefficient land use, which leads to insufficient development potential. Some industrial parks are faced some problems, such as environmental pollution and lagging supporting facilities. The problem of brain drain and lagging industrial innovation due to improper design of the public space environment of the industrial park is particularly serious.

With the continuous optimization and upgrading of industrial parks and the integration of industry and city, more and more attention has been paid to the material space that carries the development of the industry. People are the key to the development of industrial parks. The quality of public space in industrial parks directly affects the satisfaction of talents with work and living environment. The beautiful landscape and well-equipped public space environment can attract high-tech talents to settle in and improve work efficiency, the lack of diversity in the public space environment will have the opposite effect. Public space design is particularly important for the sustainable development of industrial parks.

2. The Development Process and Existing Problems of Public Space in China's Industrial Parks

2.1. Development History of Public Space in Industrial Park

Since the reform and opening up, China's industrial parks have gone through different stages of development. Starting from the earliest Shenzhen Shekou Industrial Zone, development zones, free trade zones, and high-tech zones have emerged from all over the country. The construction of public spaces has also experienced a process from monotony to multiple humanization. According to Ren Hao[1] and Liu Jiajun's[2] division of the development stages of China's industrial parks, the development process of public space in the industrial parks can be divided into four stages accordingly.

The first stage (1979-1991), the construction of the industrial park starts with the establishment of the Shenzhen Shekou Industrial Park. This type of industrial park is generally located on the edge of the town and consists of a group of industrial plants used for industrial production and storage. The service facilities are provided by the old city. In general, the environmental quality of industrial parks is low, and the plot division and road network layout adopt a grid and checkerboard layout, and there is almost no landscape design.

The second stage (1992-2002), with the rapid development of industrial parks, various types of industrial parks have emerged, such as economic and technological development zones, high-tech development zones, and export processing zones. The construction of public spaces in industrial parks began to appear during this period. A small number of industrial parks have relatively advanced planning concepts, and the proportion of service facilities and green parks is relatively high. For example, the Suzhou Industrial Park established in 1994 has a general land allocation ratio of 39% for industry, 4% for commerce, 25% for residential, and 32% for infrastructure and parks.[3] Commercial service facilities and the layout of parks and green spaces have added greater vitality to the industrial park.

The third stage (2003-2010), the construction scale and industrial connotation of the industrial park are gradually expanding, from a single industrial park to a comprehensive industrial park. The development of industrial parks focuses on optimizing and upgrading the industrial structure, rationally developing and intensively using natural resources, and building the industrial park into a modern park with a beautiful natural environment. For example, the Hefei High-tech Industrial Park, which was put into use in 2011, is equipped with modern squares and trails. The public green space of the industrial park is grouped among

office buildings, and there are also supporting facilities such as dormitories, commerce, catering, and sports venues, which can meet the daily needs of employees [4].

The fourth stage (Since 2011), modern manufacturing and modern service industries are integrated and developed, and the public space of industrial parks has become richer and more diverse, gradually integrating modern business, leisure, and entertainment functions. Planning strategies for industrial park functions such as complex functions, diversified spatial layouts, and ecological construction of the environment are gradually proposed[5].

2.2. The problem

Through research and analysis of the development process of public space in China's industrial parks, it is found that there are three problems in the planning and construction of public space in industrial parks:

Single public space service function. Diversified service functions are the main body that stimulates people-to-people exchanges. The public spaces of most industrial parks only support basic production and living services. The diversified functions such as leisure and entertainment, sports and fitness are relatively lacking, which makes the public space of industrial parks unattractive and uncreativity.

Poor interaction in public spaces. Many industrial parks adopt closed management, and their internal public spaces are not well linked with the city in terms of function, form, and environment. On the one hand, the public space level of the park is relatively monotonous, on the other hand, public space resources will be idle during non-working days

Inefficient use of public space. Many industrial parks lack humane considerations in the public space construction, and problems such as large-scale, poor accessibility, and lack of stop-and-go furniture pieces have appeared, which have caused the public space of industrial parks to lack public appeal and reduce the enthusiasm of crowd participation.

3. Lessons from experience in public space planning of industrial parks

This paper selects successful cases of public space design in industrial parks in different regions for research, and summarizes the planning and design strategies of public space in industrial parks.

3.1. Zhongguancun High-end Medical Apparatus and Instruments Industry Park, Beijing

The area of Zhongguancun High-end Medical Apparatus and Instruments Industry Park is 19.19 hectares. It focuses on the production of high-end medical apparatus and integrates production, research and development, and incubation. The industrial park paid great attention to the shaping of public space in the planning and design stage, and adopted design techniques such as functional composite, three-dimensional space, and landscape penetration to form a spatial environment with rich space and harmonious architecture.(Figure 1)

Functional compounding refers to the integration of diversified functions. In addition to production and R&D functions, the industrial park also includes different types of life service facilities, such as supermarkets, restaurants, gyms, and shops, which can provide all-day life services and bring greater vitality of the crowd to the park. Three-dimensional space refers to the design of connecting corridors, stairs and other transportation facilities to connect different types of open spaces, such as roof greening, lower courtyards, squares, and viewing platforms to form a whole, which can improve space connectivity and use efficiency (Figure 2). Landscape penetration is the use of Chinese traditional courtyard layout and gardening techniques in the design to form a landscape interaction between outdoor space and indoor space, and enhance the green space experience of the industrial park (Figure 3).



Figure 1. Layout of Zhongguancun High-end Medical Apparatus and Instruments Industry Park. Source: 'google earth'.



Figure 2. Three-dimensional space. Source: '<https://www.gooood.cn/zhongguancun-high-end-medical-apparatus-and-instruments-industry-park-wdce.htm>'.



Figure 3. Landscape penetration. Source: '<https://www.goood.cn/zhongguancun-high-end-medical-apparatus-and-instruments-industry-park-wdce.htm>'.

3.2. Google Headquarters Park, Silicon Valley, U.S.

The Silicon Valley Google Headquarters Park in the United States covers an area of about 10 hectares. The open central green space is used to break the traditional limitations of public and private spaces and provide more public space for the park's scientific and technical personnel (Figure 4).

Google headquarters set up a public activity plaza on the green space in the center of the park, providing outdoor gathering venues such as cafes, catering, and chairs, and arranged sports and entertainment spaces in the west of the plaza to enrich the types of public activities (Figure 5). In the treatment of public and private spaces, the industrial park connects various public spaces by unifying campus and park landscapes, blurring the boundary between public and private, which makes public spaces more diverse and complex.

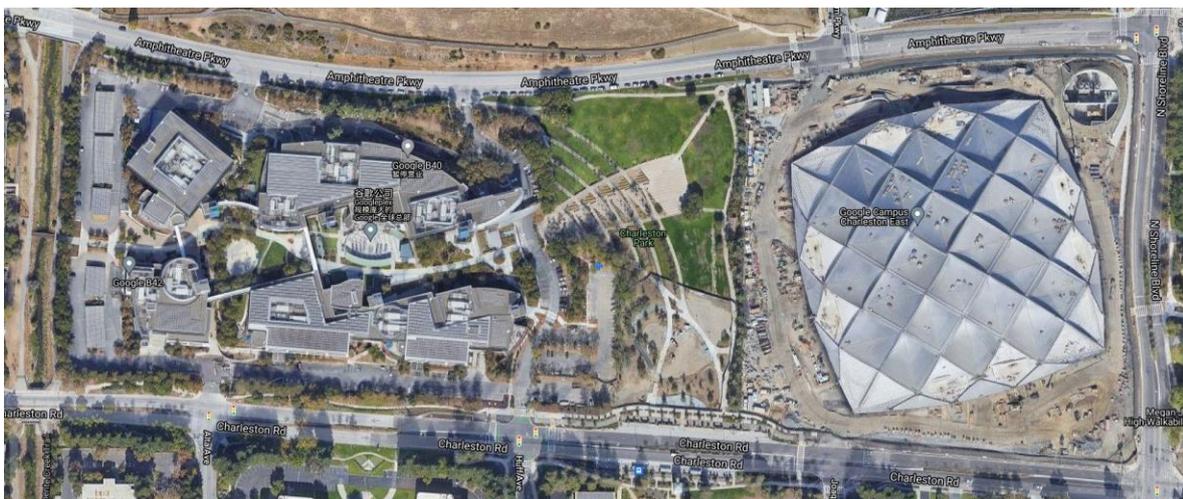


Figure 4. Layout of Google Headquarters Park, Silicon Valley, U.S. Source: 'google earth'.



Figure 5. Central Event Plaza. Source: 'http://blog.sina.com.cn/s/blog_51d528930102e40u.html'.

3.3. Eindhoven High-Tech Industrial Park, The Netherlands

The Eindhoven High-Tech Park in the Netherlands is known as the smartest 1 square kilometer, with an average of 4 patents generated every day, accounting for 50% of the Dutch patents. The planning and design of the park is mainly built around the theme of "open innovation". In order to achieve this goal, the design of the park's public space is unique.

In order to encourage people to communicate with each other and stimulate creativity, public service facilities in the park, such as restaurants, conference centers, and concert halls, are concentrated in public communication blocks, thereby creating more opportunities for face-to-face communication (Figure 6). In terms of improving the environmental quality of the park, the natural landscape features are extended to the inside of the park, and more walking space is added, including waterfronts, wooden planks, and forest trails, which can ensure the continuity of the natural landscape. These roads have become talent exchange streets (Figure 7).



Figure 6. Public exchange block. Source: '<http://www.landscape.cn/planning/10128.html>'.



Figure 7. Waterfront plank road. Source: '<http://www.landscape.cn/planning/10128.html>'.

3.4. Case Summary

It can be seen from the above cases that the development trend of public space in industrial parks can be summarized in three aspects: diversified vitality, rich spatial hierarchy, and pleasant landscape. Specifically, the diversification of vitality means that the industrial park should create a public place with multiple functions and individualization to meet the needs of different groups of people, thereby increasing the vitality of the industrial park. Rich spatial hierarchy means arranging diversified landscape

types in the industrial park and connecting public spaces in the three dimensions of air, ground, and underground through corridors and walkways, which enriches the public space experience, increases people's interest in using it, and increases the efficiency of space use. Pleasant landscape means that the industrial park should be coordinated with the surrounding environment, and the design techniques of borrowing and facing the landscape should be adopted to increase the perceivable amount of greenery.

From the perspective of planning and design, creating a public space in an industrial park with diversified vitality, rich spatial levels, and pleasant landscape is to connect and integrate the original lack of vitality of green spaces and squares, and then incorporate diversified life service functions. This method of connecting and integrating static and isolated public spaces to form diverse and complex public spaces can be called "sharing".

Case name	Summary of experience
Zhongguancun High-end Medical Apparatus and Instruments Industry Park, Beijing	All-day life service facilities, Sinking plaza, Green Roof, Three-dimensional space, Landscape penetration.
Google Headquarters Park, Silicon Valley, U.S.	Public Center Plaza, Diversified activities, Shared use of public space and private space.
Eindhoven High-Tech Industrial Park, The Netherlands	Outdoor public exchange block, Integrate into the surrounding natural environment.

Table 1. Summary of Experiences of Public Space in Industrial Parks. Source: Author self-painted.

4. Optimization strategy of public space in industrial parks based on the concept of sharing

4.1. "Sharing" concept

As early as 2015, China put forward the five development concepts of innovation, coordination, greenness, openness, and sharing. Among them, shared development emphasizes the solution of social fairness and justice, and points out the direction for China's social development. In February 2016, the "Several Opinions of CPC Central Committee and State Council on Further Strengthening the Management of Urban Planning and Construction" mentioned that "adhere to the concept of shared development, so that the people have more sense of gain in joint construction and sharing." In October 2016, the "New Urban Agenda" of the Third United Nations Conference on Housing and Sustainable Urbanization put forward the common vision of "a city for all". It can be seen from this that "sharing" is the theme of current world urban development. The connotation of "sharing" can be interpreted as meeting the development needs of multiple individuals, strengthening sustainable construction, and adhering to the urban construction concept of equality for all and people-centered.

4.2. The significance of public space sharing in industrial parks

Industrial parks are an important engine supporting urban economic development, an important part of a city, and an urban space closely related to residents. Therefore, in the context of the era of "everyone sharing the city", it is of greater significance to make full use of resources, take sharing as a way, and enhance the public space for the purpose of enhancing the vitality of industrial parks.

4.2.1 Enhancing the connectivity of open space system

Public space should not be isolated, but should be mutually infiltrated with the entire space environment. Sharing can improve the accessibility and interaction between different public spaces and effectively reduce the fragmentation of the open space system. On the other hand, sharing can free up green space in industrial parks. For example, the plazas and green spaces within each enterprise are integrated into the entire open space system to increase the perceivable amount of greenery, and it also promotes the formation of interaction spaces between employees of different enterprises and stimulates innovation vitality.

4.2.2 Improve land use efficiency

Sharing is the reuse of idle space. For example, the exclusive sports field inside the enterprise is provided to the public during non-working hours, which can allow the space resources that were not previously in contact with the public to be reused and improve the efficiency of land use. Sharing also includes the integration and innovation of space functions, such as integrating public service facilities such as corporate exhibition halls and cultural halls into commercial and leisure functions to form a highly integrated composite space, which can enhance the vitality of public spaces.

4.3 Public space optimization strategy of industrial parks under the concept of sharing

This article is based on case study and combined with the planning practice of the Taiyuan Starting Area (hereinafter referred to as "Taiyuan Starting Area") of Xiaohu Industrial Park, Shanxi's Transformation Comprehensive Reform Demonstration Zone. The optimization and improvement of public space quality in industrial parks based on the sharing concept can be embodied in three dimensions: In the dimension of crowd sharing, provide diversified service facilities and promote interactive communication based on the needs of different groups of people. In the dimension of space sharing, connect different types of public spaces, and strengthen spatial continuity and integrity. In the dimension of time sharing, enrich the functional activities of different time periods in the public space and create a 24-hour vitality space.

4.3.1 Crowd sharing dimension

People are the subject of public space use, and diverse groups of people are the foundation of the vitality of public spaces. Therefore, the design of public spaces should consider the needs of different groups of people to create diversified activity spaces.

(1) Migrant workers and local residents

The use of public spaces and service facilities by migrant workers is concentrated during the daytime in workdays, while local residents need to use public spaces and service facilities throughout the day. This requires that the layout of public spaces and service facilities in industrial parks should fully consider the use of local residents. For the industrial park-level public space and service facilities, while considering convenient transportation and balanced services, it is advisable to arrange them adjacent to the residential area to facilitate the use of local residents. The public spaces and service facilities of residential district-level and industrial neighborhood units should be arranged in a balanced manner in accordance with the distribution of the population (Figure 8).

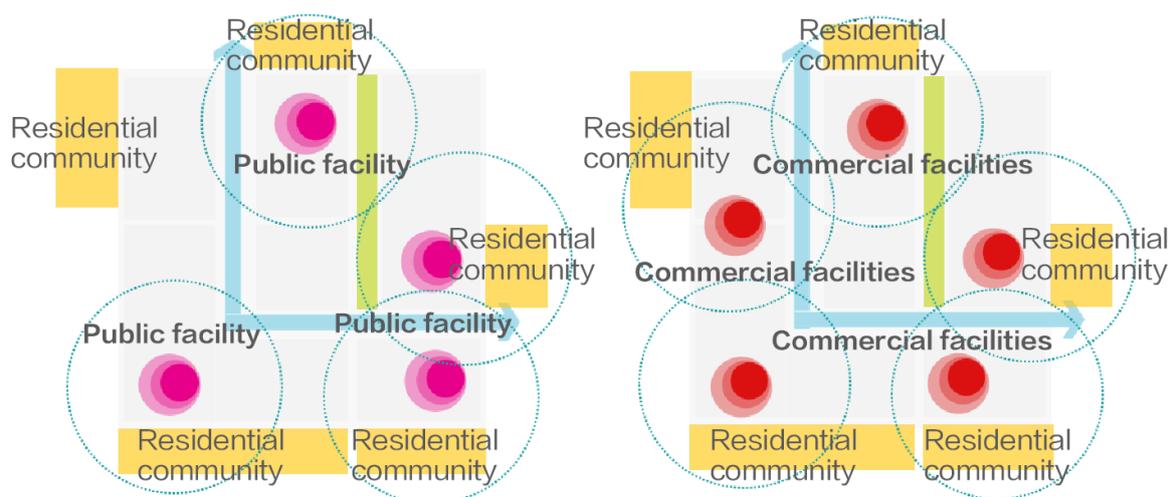


Figure 8. Schematic diagram of shared service facilities. Source: 'Five Centers Conceptual Urban Design'.

(2) Different age groups

For the elderly, safety is the primary consideration for this group of people, including walking safety and facility safety. This requires adequate barrier-free design and protection design in the design of public spaces, as well as sufficient street furniture for sitting and chatting. For middle-aged people, supporting facilities for living services and convenient transportation are important considerations. Public spaces should be surrounded by supermarkets or convenience stores and venues for cultural and sports activities, and facilities should be provided according to the service radius to improve convenience. For young people, the design of public spaces should emphasize variability to meet the needs of diverse activities. Young people pay more attention to the quality of the environment and the diversity of service functions. For example, the book bar with casual dining functions is far more attractive to young people than traditional community libraries. For teenagers and children, in the design of public space, provide as many play and sports facilities as possible. Safety is also a key consideration for this group of people, including the safe use of facilities and the convenience of parental care to avoid injuries to children and adolescents.

4.3.2 Space sharing dimension

Space sharing is to enhance the connectivity between different spaces to form a composite three-dimensional and hierarchical spatial structure system, which can be embodied in the sharing of flat and three-dimensional spaces.

(1) Flat public space sharing

Flat public space mainly includes street space, green space and square space. Street space is a path connecting different spaces, and it is also a place where traffic activities occur most frequently. For industrial parks, streets with low traffic flow in the core living area should be used as the main construction area for shared space. In the design, the optimization of the road cross section and the arrangement of commercial facilities along both sides of the road can create a relaxed and leisure street environment (Figure 9). Green space and square space are public nodes for residents' exchange activities. The spatial layout can be arranged in the method of "less concentration and more dispersion". Large green spaces and squares should be arranged in densely populated areas of the industrial park to provide diversified service functions. Small community green spaces and squares should be distributed and balanced to serve the surrounding people and provide basic service functions (Figure10). In terms of spatial organization, strengthen the spatial connection between green space squares of different scales, and connect the green space inside the enterprise and the community with the large green space in the

industrial park through shared green belts and slow walking trails, in order to give play to the overall benefits of the green development space (Figure11).

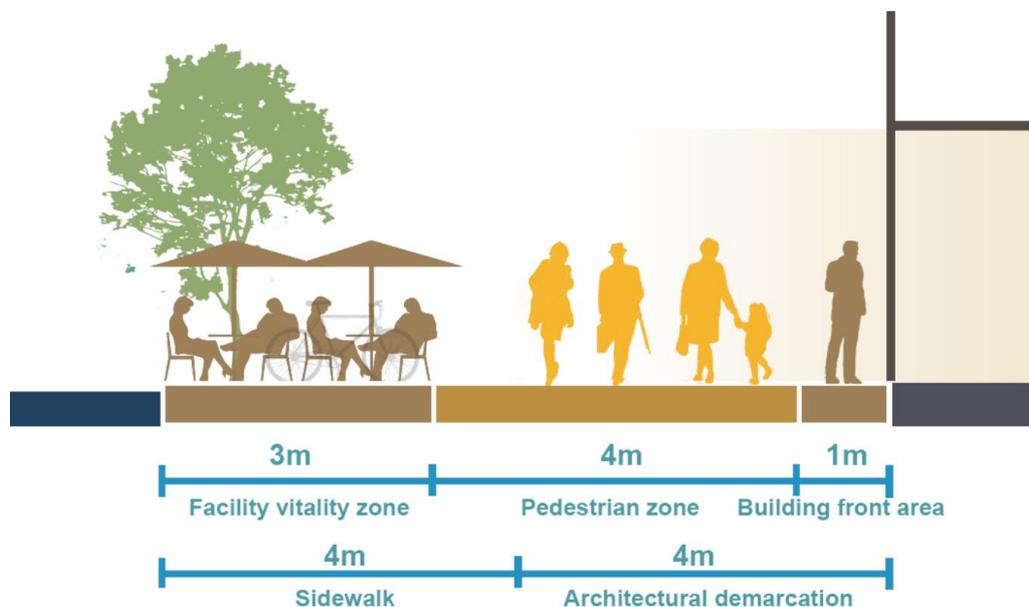


Figure 9. Schematic diagram of the cross section of Vigor Street. Source: 'Five Centers Conceptual Urban Design'

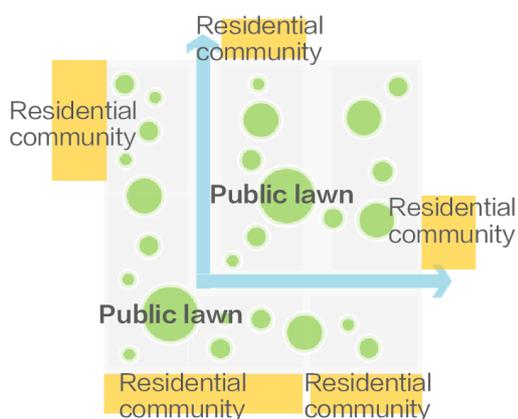


Figure 10. Green space layout. Source: 'Five Centers Conceptual Urban Design'.

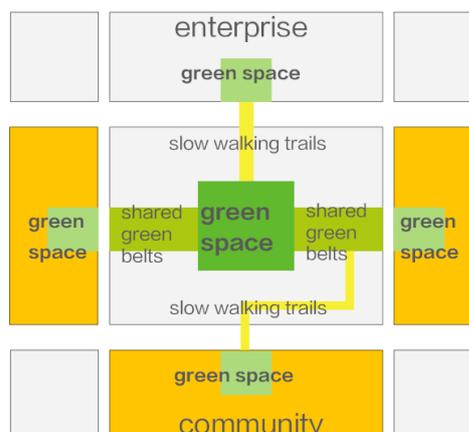


Figure 11. Green space connection method. Source: 'Five Centers Conceptual Urban Design'.

(2) Three-dimensional public space sharing

Three-dimensional space sharing is the integration of public spaces such as sunken squares, parks and green spaces with architectural spaces such as sky corridors and roof greening to form a complete spatial streamline and improve the efficiency of space use. Three-dimensional space design should pay attention to fun, accessibility, and visibility. Interesting is that the three-dimensional space level should be as rich and diverse as possible, so that the crowd can experience different spatial feelings in the process of using the space, and achieve the effect of moving and changing sceneries(Figure12). Accessibility is to ensure the continuity of space activities and avoid the phenomenon of people going back when they intersect in different spaces, which will reduce the experience of space use. Visibility is a medium that triggers communication activities, allowing people outside the space to observe the activities of the public space in order to decide whether to join (Figure13).

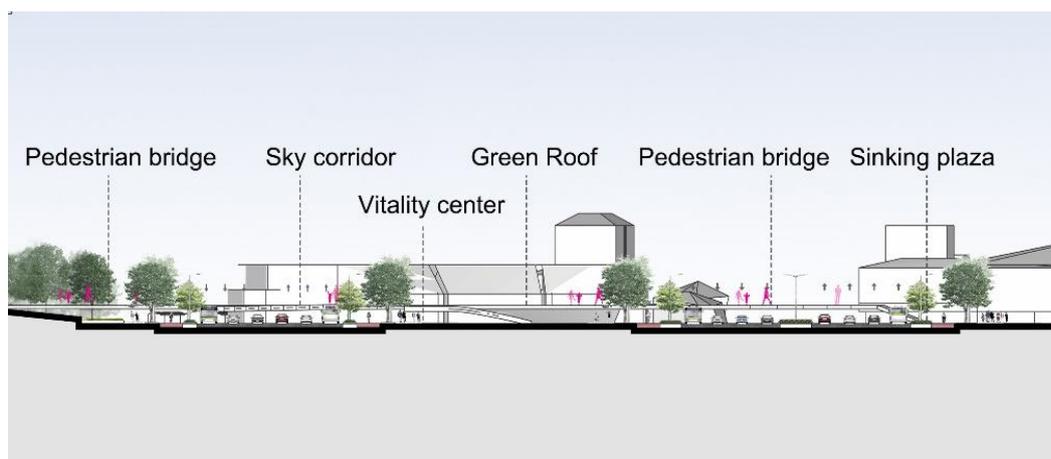


Figure 12. Schematic diagram of three-dimensional space design. Source: 'Five Centers Conceptual Urban Design'.

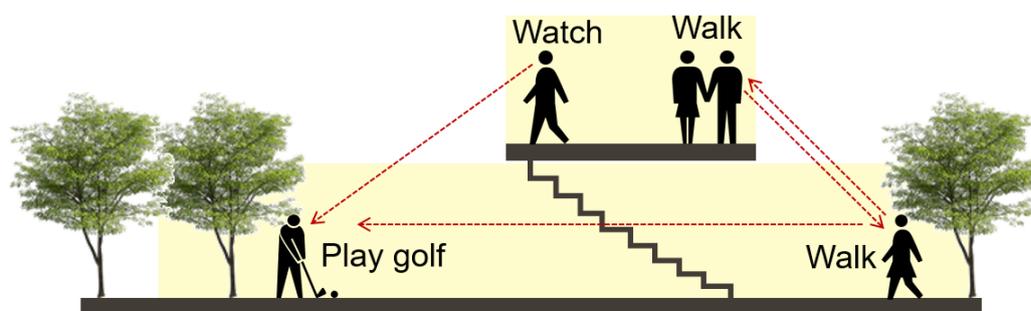


Figure 13. Schematic diagram of three-dimensional spatial visibility. Source: 'Five Centers Conceptual Urban Design'.

4.3.3 Time-sharing dimension

Through time-staggered utilization of public space, the use dimension of public space is elongated and the effective use of space resources is achieved.

(1) Shared all day

All-day sharing includes two modes. One mode is to treat the industrial park as a whole, create a 24-hour vitality area around working people and local residents, and set up catering, shopping, leisure, sports, entertainment and other functions in a continuous public space to increase the vitality of the space. Another mode is to arrange multiple functions with different usage times in the same space, thereby extending the space usage time. For example, life streets provide commuting and communication among people during the day, and as "outside stalls" of specialty shops at night, and can be used as parking spaces after early morning.

(2) Time sharing

Time-sharing is to share the internal public space of the industrial park, such as office space, scientific research institutes, etc., for the use of the public during the non-use period, so as to improve the efficiency of space use. At the spatial design level, a semi-open or fully open layout should be adopted to appropriately blur the space boundary between the interior and exterior of a single plot to ensure the smooth flow of the internal and external traffic environment.

5. Planning Practice of Taiyuan Starting Area

Taiyuan Starting Area is located in the southern part of downtown Taiyuan and at the core of Xiaohe Industrial Park (Figure 14). It is a new industrial zone formed by Shanxi Province's exploration of economic restructuring by integrating the original development zones and expanding southward, which has become the main battlefield for advancing the reform, innovation and development of the development zone, and will be built into a pilot zone for the transformation of the national resource-based economy in the future. The project practice includes the overall urban design of Taiyuan Startup (hereinafter referred to as "Overall Urban Design"), the controlled detailed planning of Taiyuan Startup Zone (Central District) (hereinafter referred to as the "Controlled Detailed Plan"), and the conceptual urban design of the "Five Centers" in Taiyuan's Starting Area (hereinafter referred to as "Five Centers Conceptual Urban Design").

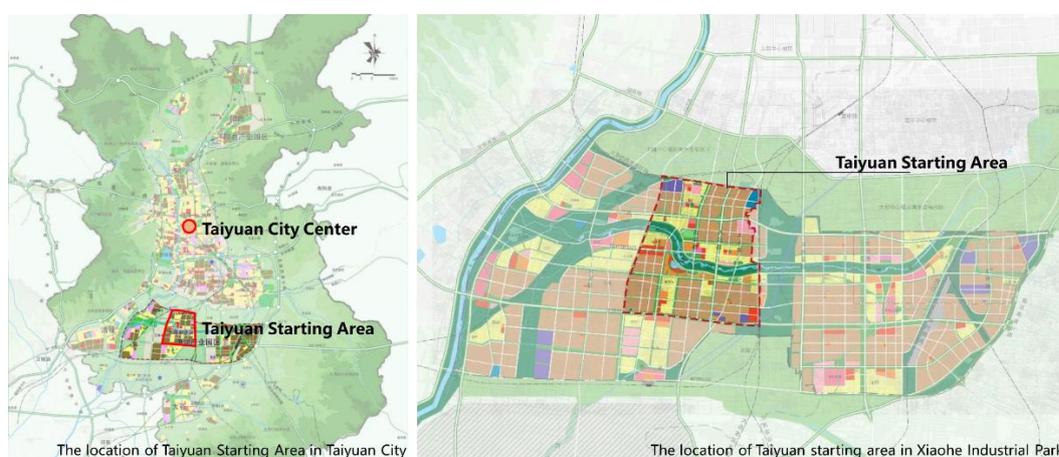


Figure 14. Location of Taiyuan Starting Area. Source: 'Conceptual Master Plan of Xiaohe Industrial Park, Shanxi Transformation Comprehensive Reform Demonstration Zone'.

5.1. Build center: All-day public vitality center

Taiyuan Starting Area, as the initial construction area of Xiaohe Industrial Park, carries functional formats such as industrial research and development, business office, residence, conferences and exhibitions, culture and sports, etc. (Figure 15) How to use the limited construction investment cost to maximize economic benefits, effectively attract enterprises to settle in, and stimulate the vitality of the industrial park is the first problem to be solved in the planning.

To cope with this problem, this project introduces the concept of "sharing" and creates an open and shared industrial park to make full use of limited public resources. In terms of space design, the planning proposes a compact and efficient development model, emphasizing the combination of land use functions and the three-dimensional combination of building functions to shape the image of the city center. Land use function compounding includes commercial and business land compounding, cultural and sports land compounding, cultural land compounding, etc. (Figure 16), which can increase the compatibility of land use functions and improve land use efficiency. The three-dimensional complex of architectural functions refers to the integration of diversified use functions of public buildings such as commercial and commercial buildings, exhibition buildings, and cultural buildings to improve the efficiency of space use (Figure 17). On the basis of complex functions, the planning is to focus on the needs of different groups of people, and arrange commercial, catering, leisure and entertainment functions in areas where communication activities may occur to create a 24-hour vitality center (Figure 18).



Figure 15. Aerial view of the core area of Taiyuan Starting Area. Source: 'Five Centers Conceptual Urban Design'.



Figure 16. Land use complex planning. Source: 'Five Centers Conceptual Urban Design'.



Figure 17. Diagram of 3D composite buildings. Source: 'Five Centers Conceptual Urban Design'.



Figure 18. 24-hour vitality center. Source: 'Five Centers Conceptual Urban Design'.

5.2. Tolerate: Balanced and shared service facilities

In terms of supporting public service facilities in the industrial park, the planning is to deploy public service facilities at the three levels of "industrial park level-residential area level-neighborhood unit level". Industrial park-level public service facilities serve the entire comprehensive reform demonstration zone. Residential area level public service facilities serve the planned residential district. Neighborhood unit level public service facilities are located in residential neighborhood units and industrial neighborhood centers, and provide community level public and commercial services (Figure 19). Supporting service facilities fully consider the diverse needs of park workers, high-end talents, entrepreneurs, and local residents, and increase the types of service facilities accordingly. For example, for the industrial and employment-oriented park, a workers' library is planned; for the living needs of local residents and foreign talents, street squares, fitness venues and other life-related service facilities are arranged; for the high-level consumption needs of residents and employees, the plan is also set up Commercial service facilities such as financial street and times commercial plaza.

For large-scale public service facilities, the plan proposes time sharing, hierarchical sharing, and classified sharing. Time-sharing is to focus on the function conversion of large public buildings, for example, the layout of the exhibition center fully considers the different functional requirements during and after the exhibition, and proposes corresponding operation strategies to improve the efficiency of facility use (Figure 20). Hierarchical sharing emphasizes the multi-functional and mixed use of public buildings, incorporates diversified use functions, and improves the efficiency of space use. Classified sharing means that large-scale cultural and sports facilities related to residents' lives are arranged close to the residential area, which is convenient for the community to use.

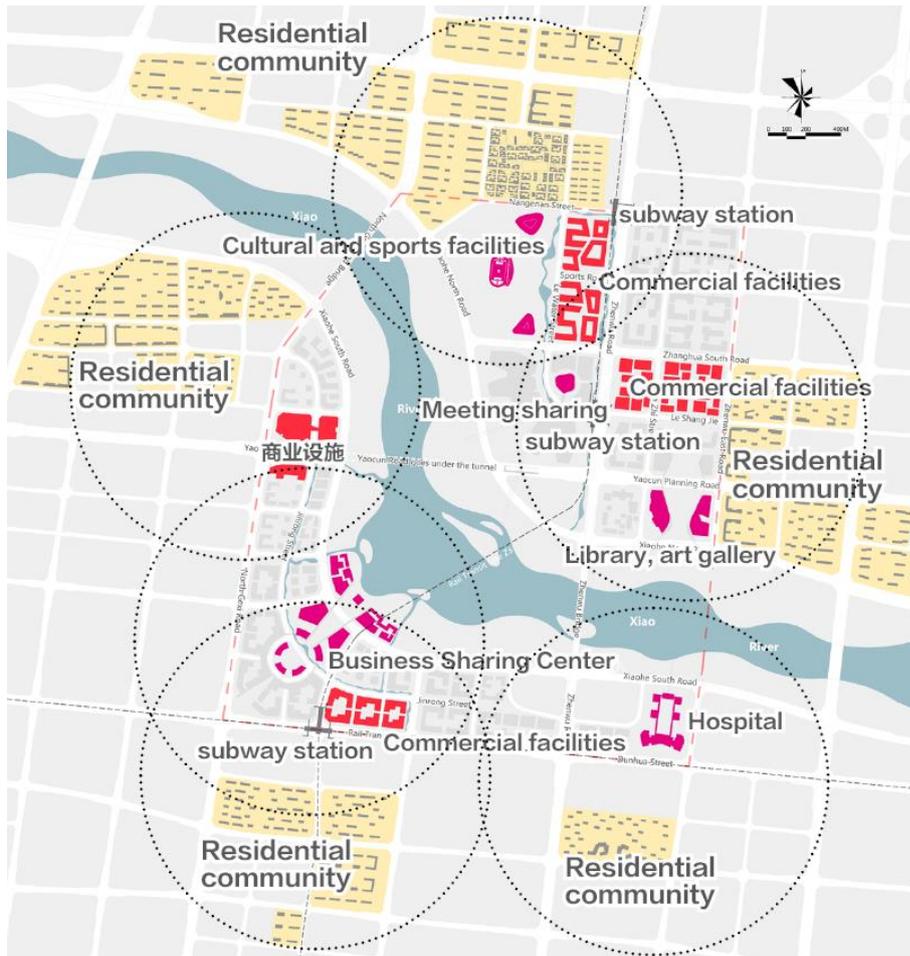


Figure 19. Layout plan of public service facilities in the core area. Source: 'Five Centers Conceptual Urban Design'.



Figure 20. Time-sharing strategy for exhibition center. Source: 'Five Centers Conceptual Urban Design'.

5.3. Connect: Multi-complex space system

To enrich the level of public space and create diversified exchange activities. The plan takes the Xiaohe Landscape Belt as the core, and connects the Xiaohe landscape belt with public spaces such as cultural parks, sports parks, and citizens’ squares in the core area, as well as convention and exhibition centers, stadiums, art galleries, commercial complexes, and other services through slow traffic, internal roads and waterfront roads. In addition, make full use of underground space, combined with rail transit stations to arrange underground commercial facilities and entertainment facilities, and connect with the public space above the ground through underground passages (Figure 21), forming a vital public space system that integrates underground and above ground (Figure 22).

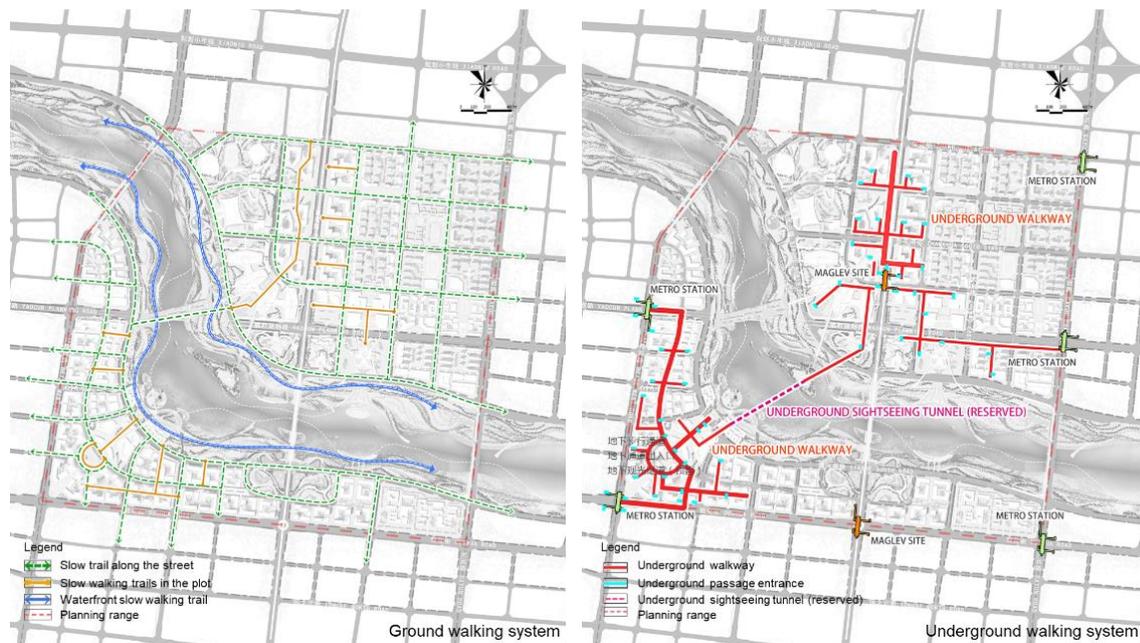


Figure 21. Planning drawing of ground and underground pedestrian system. Source: ‘Five Centers Conceptual Urban Design’.



Figure 22. Ground and underground integration planning map. Source: ‘Five Centers Conceptual Urban Design’.

In terms of street space design, the plan provides more space for walking and communication by optimizing the road cross section (Figure 23). It is planned to create three vibrant streets with pedestrians as the mainstay, they are the central vibrant commercial street focusing on shopping, entertainment and leisure, the cultural experience smart street focusing on cultural display, shopping and entertainment, and the sports and leisure water street focusing on waterfront leisure and sports (Figure 24).



Figure 23. Vibrant Street Cross Section. Source: 'Five Centers Conceptual Urban Design'.



Figure 24. Sports and leisure water street. Source: 'Five Centers Conceptual Urban Design'.

5.4. Penetration: Pleasant green landscape

In terms of green space landscape, the plan emphasizes the infiltration of the surrounding ecological environment and regards it as a part of the landscape environment of the industrial park, which is combined with the green space landscape inside the industrial park to form a multi-level networked landscape system.

The planning combines land use layout and plan design to build a green landscape system that integrates waterfront landscape, road landscape, park green space, industrial area, and core area (Figure 25), and fully introduces the Xiaohu River landscape into the park to increase the amount of greenery that residents can perceive. In terms of landscape penetration design, the planning forms three landscape

penetration axes, namely the sports and leisure axis (Figure 26), the conference and exhibition axis, and the administrative and cultural axis. Public spaces and public service facilities are arranged along both sides of the axis to increase the vitality of the crowd.



Figure 25. Planning of green space landscape system in the core area. Source: ‘Five Centers Conceptual Urban Design’.



Figure 26. Vitality space on both sides of the sports leisure axis. Source: ‘Five Centers Conceptual Urban Design’.

6. Concluding remarks

According to the concept of sharing, this article re-understands the relationship between people and the environment, and between people in the industrial park. Through a case study of the public space construction of excellent industrial parks, and combined with the project practice of Taiyuan starting area,

it summarizes the public space optimization strategies of industrial parks that are in line with the requirements of the times, humane, and can stimulate innovative vitality, and provide a certain reference and guiding significance for promoting the high-quality development of industrial public spaces.

The three-dimensional space optimization strategy of crowd sharing, space sharing, and time sharing does not yet represent all aspects of the optimization and promotion of public space in industrial parks. It is hoped that there will be more research and practice in the shared use of public and private spaces, outdoor and indoor spaces of buildings, etc., to further supplement and improve the optimization path of public space in industrial parks, and promote the high-quality development of industrial park space.

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