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The Renovation Design of Traditional Parks in the Context of Urban Renewal: A Case Study of Wukong Bridge Park in Jiaozuo City

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Abstract: *Urban parks, as essential spaces for enhancing residents' quality of life and improving urban ecological environments, have gradually become a core component of urban renewal. This paper takes Wukong Bridge Park in Jiaozuo City, Henan Province, as a case study to explore how the integration of historical site preservation and modern design concepts can enhance the ecological, social, and cultural benefits of parks within the context of urban renewal. The paper summarizes the design experiences from the renovation of Wukong Bridge Park, emphasizing the organic combination of historical cultural heritage, ecological restoration, and functional integration. The aim is to provide theoretical insights and practical references for similar projects.*

Keywords: *Urban Park, Renovation Design, Ecological Sustainability, Historical and Cultural Preservation*

1. Introduction

As urbanization accelerates, the development of Chinese cities has gradually shifted from the expansion of new districts to the optimization of existing spaces. Urban renewal has become a key strategy to address ecological degradation and resource inefficiency. The concept of a "Park City" has emerged, emphasizing the enhancement of residents' quality of life through the construction of high-quality green spaces, achieving harmonious coexistence between humans and nature [1]. Moreover, the design process should prioritize regional culture and historical continuity [2]. In this context, modern park design that integrates local characteristics and historical context not only improves ecological quality but also fosters cultural identity and social interaction, becoming a crucial direction in urban park development [3].

This paper examines the renovation project of Wukongqiao Park, exploring how to effectively integrate historical and cultural heritage, ecological restoration, and modern design within the framework of urban renewal. The study summarizes the design experiences gained during the renovation process, aiming to provide practical insights and theoretical references for similar projects.

2. Project Background and Current Situation Analysis

2.1. Project Background

Wukong Bridge Park is located at the location of the former factory of Jiaozuo Special Light Bulb Factory.In the year 2000, following a government plan to relocate the factory, the site was turned into a street park in conjunction with the Jianshe Road Memorial green space. This development has filled a lot of space missing in public green places in the eastern side of Jiaozuo.The park was formally completed and opened to the public on June 1, 2003 [4].

2.2. Location Analysis

The Wukong Bridge Park renovation project is located in the north of the city center in the Shanyang District of Jiaozuo City. It enjoys convenient transport access in a clean environment with ecological sustainability. The project takes place in the southwest corner of the intersection of

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Donghuan Road and Jianshe Road, with Jianshe Road to the north, East Ring Road to the east, and Wengjian River to the south and west, covering an area of about 4 hectares. The surrounding area is well-equipped with supporting facilities, including important institutions such as the municipal government, People's Hospital, and schools. The area also includes multiple residential communities, with abundant administrative, educational, medical, and transportation resources (see Figure 1).

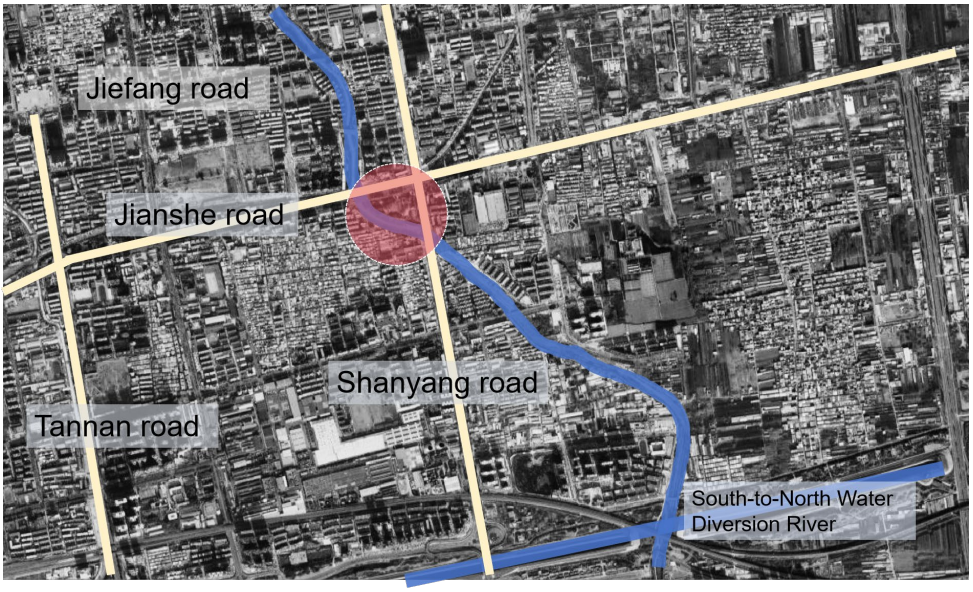

Figure 1: Site Map of Wuhong Bridge Park

2.3. Current Situation Analysis

2.3.1. Site Advantages

Table 1: Analysis of Site Advantages

Site advantage	Current situation	Research photos
regional advantage	Wukong Bridge Park is located in the main urban area of Shanyang District, Jiaozuo City, adjacent to the main traffic arteries.The surrounding population is dense, with strong geographical and traffic advantages, which is convenient for the daily use of the citizens.	
Infrastructure framework	The park has perfect infrastructure and clear division of functional areas, which is convenient for the use and management of different groups.	
Greening advantages	The greening of the park is good, and many trees in the park grow vigorously, which provides a stable ecological environment foundation.	

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2.3.2. Site Disadvantages

Table 2. Analysis of Site Disadvantages

Site disadvantage	Current situation	Research photos	countermeasures
Old infrastructure	Park facilities are aging, some infrastructure and internal facilities are old.		Repair infrastructure, update seats, trailsand fitness equipment, etc.
function distribution	The function of the park is single, the supporting facilities are not perfect, and the division of functional areas is not systematic, which fails to fully meet the needs of different groups.		Re-planning functional areas and setting up diversified facilities
Ground cover plants are poor	The lower plants in the park lack maintenance, and the quality of the ground cover is poor. There is a phenomenon of loess bareness in some areas, which affects the greening effect and ecological environment.		Replant local plants to enhance the level of greening and biodiversity
closed question	The park is relatively closed and the entrances and exits are not obvious, which limits the openness and accessibility of the park.		Optimize the design of entrances and exits to enhance the accessibility and openness of the park.

In summary, Wukong Bridge Park currently exhibits a mixture of strengths and weaknesses (see Table 1 and Table 2). Through scientific planning and multi-stakeholder collaboration in the renovation project, the park's inherent locational advantages and existing green infrastructure are expected to be further enhanced. Meanwhile, systematic upgrades targeting inadequate functionality, outdated facilities, and a lack of cultural cohesion are anticipated to bring higher-quality public space and improved living experiences to the old urban district.

3. Design Concept

The renovation of Wukong Bridge Park aims to create an urban park that integrates historical cultural preservation, ecological restoration, and modern design principles, offering a space that both honors its historical roots and embraces contemporary vitality (see Figure 2).

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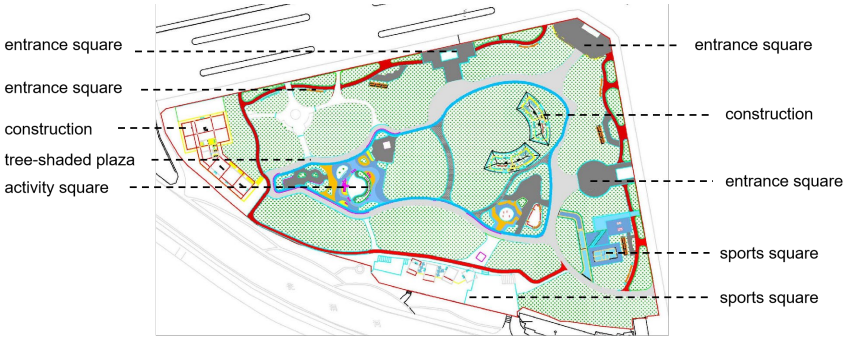

Figure 2: Site Plan of the Five Arch Bridge Park Renovation Project

- Integration of Historical Culture and Modern Functionality

The design respects the historical context by preserving and repurposing original architectural elements and reinforced concrete foundations, thus maintaining the industrial heritage of the site[5]. Inspired by the spirit of "striving for progress," the design incorporates the symbolic element of a light bulb beam, creating a multifunctional space that seamlessly integrates historical significance with modern functionality.

- Ecological restoration and low-impact development

The renovation will adopt the concept of Low Impact Development (LID), incorporating ecological restoration, a rainwater management system, and permeable paving materials to enhance the park's ecological function and sustainability. The focus will be on increasing green coverage, improving plant diversity, reducing impervious surfaces, and improving the microclimate [6].

- Functional and Adaptive Design

The park renovation will involve the reorganization of functional areas to create diverse activity spaces that meet the needs of different user groups. The design prioritizes age-friendly and child-friendly principles, with the addition of spaces for senior interactions, children's play areas, and safe, interactive shared spaces to ensure the needs of residents across all age groups are addressed [7][8]. Furthermore, the integration of "micro-commercial" and "micro-sports" elements will enhance the park's vitality and sustainability, fostering greater interaction and social engagement between the commercial and sports facilities[9].

4. Renovation Strategy

4.1. Layout Design of Functional Zones

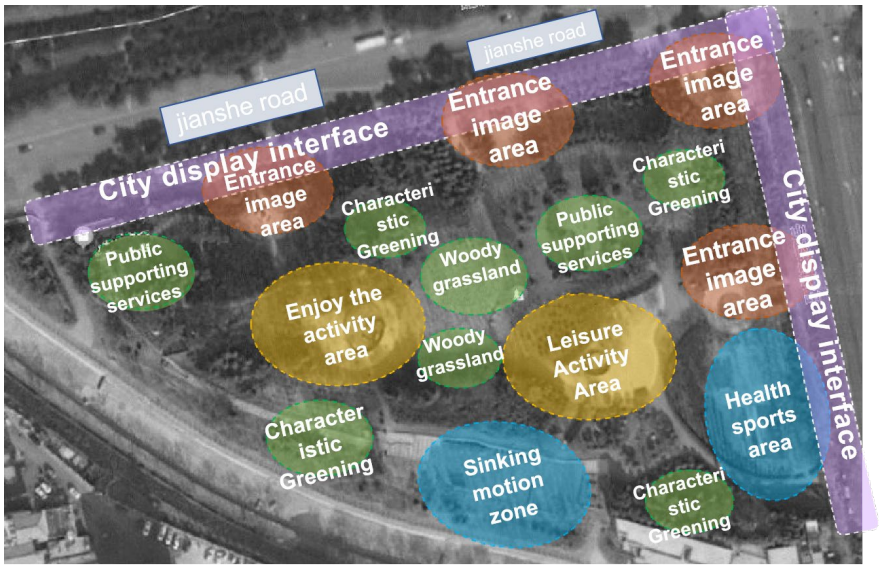

Figure 3: Spatial Functional Layout Diagram

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The renovation project of Wukong Bridge Park is centered around functionality, ecology, and user-centered design, and is divided into five major functional zones (see Figure 3). Each zone is carefully designed based on usage requirements and spatial characteristics to meet the needs of different groups and enhance the park's overall functionality (see Table 3).

Table 3: Overview of Functional Zoning Design

sectorization	design objective	main facilities	effect picture
Entrance image area	Enhance the cultural ambiance and ensure convenient park access	Landscape elements, art sculptures, signage systems, seating areas, wayfinding boards	
Recreation and Activity Area	Provide diverse entertainment options and foster social interaction	Children's play equipment, parent-child interaction zones, art exhibitions, market spaces	
Leisure and Social Area	Offer comfortable spaces for leisure and encourage community engagement	Benches, landscape trails, lawns, small water features, accessible pathways	
Health and Sports Area	Accommodate various sporting activities to promote a healthy lifestyle	Fitness equipment, running tracks, basketball courts, badminton courts, tai chi practice areas	
Sunken Activity Zone	Utilize topographical differences to create private, multi-functional spaces	Skateboarding area, dance plaza, outdoor yoga zone, nighttime sports lighting	

4.2. Ecological Sustainability Restoration

The renovated Wukong Bridge Park emphasizes sustainable design principles, integrating ecological restoration measures to enhance the park's environmental benefits and biodiversity [10]. Specific measures include:

- Rainwater Management: By installing a rainwater collection system, surface water runoff is reduced, water resource utilization efficiency is improved, and the park's water cycle is optimized.

- Ecological Greening: The design incorporates the supplementation of vegetation and the addition of plant layers, selecting native plants for landscaping to enhance biodiversity and improve the park's ecological environment (see Table 4).

- Application of Eco-friendly Materials: Permeable bricks, recycled plastics, and other sustainable materials are used to reduce impervious surfaces, enhance rainwater infiltration, and improve soil moisture retention.

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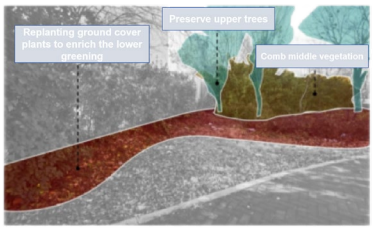
Table 4: Principles of Green Planting

<table>
<tr><td>respect to the current context</td><td>Respect the basic conditions of the status quo, retain the status quo trees appropriately, and the landscape plan should try to move the status quo greening as little as possible.</td><td rowspan="2"> 
</td></tr>
<tr><td>optimized pattern</td><td>Combing the middle and lower space greening, increasing plant thickness and chroma, replanting middle flowers and shrubs and lower ground cover.</td></tr>
<tr><td>space creation</td><td>Based on the current situation of trees, the existing site is supplemented with greening, the original diseased plants and poor-growing seedlings are removed, the shade space is formed, and the opening and closing-closing contrast of the space is created.</td><td rowspan="2"> 
</td></tr>
<tr><td>enhance the image</td><td>Combined with the landscape wall, reasonable collocation of stone, to create exquisite group, add green and colorful, set up the modern atmosphere of the delicate image of the city</td></tr>
</table>

4.3. The Principle of Preservation and Replacement

The principle of preservation and replacement is emphasized in the renovation of the Wukong Bridge Park. The existing buildings and civil structures are preserved through a reasonable approach, while undergoing renovation and updates guided by the Low Impact Development (LID) concept. This approach aims to retain the park's original historical and cultural heritage to the greatest extent possible, while fulfilling modern usage needs. The original building frameworks and reinforced concrete foundations are preserved, and modern techniques and new materials are used for optimization and restoration, revitalizing the space while maintaining its historical significance and ensuring a modern atmosphere.

Additionally, the renovation involves the rectification and restoration of the existing road network and infrastructure, optimizing the functional layout, and enhancing the overall appearance of the park. Old seats and fitness equipment are replaced, and improvements are made to the park's pathway system, lighting, and public service facilities to enhance the user experience for both visitors and residents, ensuring a harmonious balance between functionality and aesthetics.

4.4. The Principle of Functionality Emphasis

The renovated Wukong Bridge Park will be clearly positioned as an “urban micro-living room,” which is one of the core objectives of the park design. By transforming the park into a space for social, leisure, and cultural exchanges within the community, its functional value as a public urban space will be enhanced.

- Enhancing the Entrance Image: The entrance design will integrate modern and traditional elements, utilizing landscape sculptures, art installations, and signage systems to enhance the visual appeal and recognizability of the entrance, as well as to increase the park’s accessibility and iconic presence.

- Optimization of Roads and Plazas: Existing roads will be repaired, with additional accessibility features, and traffic flow lines will be improved to strengthen the connectivity between functional zones. This will ensure smooth traffic, prevent congestion, and use permeable materials to reduce soil erosion, while enhancing the visitor experience.

- Integration with Municipal Roads:The design intends to make the park more accessible with openings at the park interfaces on both sides that connect the adjoining municipal pedestrian paths to enhance a sense of pedestrian and vehicular accessibility. Along with that, seating and amenity facilities would be added to enhance the convenience and desirability of the park.

- Meeting the Needs of All Age Groups: Such a design would offer something for every age group, but special consideration would be given to older adults, children, and teenagers. All of them should have access to fitness facilities, recreational areas, and social interaction spaces, according to the

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project; equally, those of very different backgrounds must have equal access to suitable exercise and recreational activities.

▪ Enhancing Park Engagement and Interaction: The addition of multifunctional social spaces, cultural display areas, and temporary activity zones will enhance the park's interactive character and its sense of participation. Markets, festivals, and community gathering points will greatly enhance social interaction among residents and promote community cohesion within the park.

4.5. The Empowerment of "Micro-business" and "Micro-sports"

▪ The design propounds the idea of "micro-business" and "micro-sports" to empower the Five-Arch Bridge Park for its vitality and self-sustainable codification.

▪ § Inclusion of "Micro-business": In order to enhance the vitality of the park, draw more visitors to it, and to avert the restrictions of traditional commercial development, the design introduces various flexible modes of commercial services such as food, retail, and mobile stalls.

▪ "Micro-sports" Design: The design transforms the green spaces and topographic variations of the park into multi-functional sports areas, thus providing age-friendly facilities together with children's play equipment to cater to diverse levels of physical engagement of all users.

5. Post-Renovation Outcomes and Evaluation

It came to light that the Wukong Bridge Park rehabilitation brought considerable reclamation in the ecological, social, and cultural firmly. Thanks to elaborate designs and careful planning, not only has this renovated park improved the quality of urban public green spaces, but it has also increased their diversity of experiences available to residents. The following are the outcomes and evaluations of the renovated park in different fields (see Table 5).

Table 5: Evaluation of the Reconstruction Effectiveness

efficiency type	Before reconstruction	After reconstruction	effectiveness
ecological benefits	Low green coverage and poor biodiversity.	Greening coverage increased and biodiversity enhanced.	Enhance the ecological function, restore the ecological environment
social benefits	There is less community interaction	More social space and better facilities	Enhance residents ' sense of belonging and promote community interaction and health.
cultural benefits	Historical sites have not been fully utilized	Combining historical culture and modern design	Enhance the sense of local cultural identity and increase the space of cultural activities.

5.1. Ecological Benefits

Restoration in Wukong Bridge Park improved vegetation coverage, biodiversity in the area, and the parameters mentioned. The LID concept has introduced rain gardens, permeable pavements, green roofs, and other ecological facilities that reduced stormwater runoff, minimized soil erosion, and increased the park's efficiency in utilizing water resources. Also, rainwater management system has been established to promote infiltration and retention of water in the park, thus optimizing the local hydrological cycle and preventing soil erosion during the rainy season.

The park's plants were also deliberately chosen, consisting of numerous native varieties and various types of vegetation, so as to reestablish the original ecosystem and increase biodiversity. The restoring of the native plant community has helped restore ecological conditions in this park, attracting many more birds and small animals, enhancing this park's role as an ecological corridor, thus contributing to the conservation of biodiversity around here.

5.2. Social Benefits

The renovation has opened Wukong Bridge Park more than before and made it multifaceted with an

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appropriate venue for daily living and community interaction. The new fitness squares, children's play areas, cultural exhibitions, and spaces for athletics fit the need for different age groups and social segments, bringing more interest and usage by the community. With the fitness squares and sport facilities, residents will be encouraged to become more active and healthy throughout the community.

This work to reconstruct the park also acted to foster social interaction therein. These include social areas, seating arrangements for residents, and moments when culture can interact with life on an informal level. Perhaps more importantly, facilities aimed at the elderly and family groups are what transform the Wukong Bridge Park into a public space for everyone, catering to the diversity of groups within the city.

5.3. Cultural Benefits

The renovation of the Wukong Bridge Park, by preserving and utilizing the original historical buildings and sites, has effectively incorporated local historical culture into the design of the park. It preserves the historical memory of the area while providing space for the citizens to understand and experience local culture. The renovated park takes full advantage of the historical context of the site of the old light bulb factory and integrates it with proposed contemporary design concepts-fostering not only the continuation of the city's industrial heritage but also an inherent cultural meaning of the park.

The introduction of the cultural display areas and sculpture environments turned the park into a stage for urban cultural displays. Most importantly, through the appropriation of historical sites and sculpture installations, the park has secured its place in understanding local history and has attracted their share of visitors and culture aficionados. Routine exhibitions of arts and cultural events further introduce a cultural fabric into the park, which reinforces the citizens' collective sense of identity and sense of belonging to local history and culture. It facilitates the carrying on and dissemination of local culture, which in turn heightens the park's cultural allure and social value.

6. Conclusion

The renovation of Wukong Bridge Park, together with considerate designs and sustainable principles, has added much ecological, social, and cultural value to the park. The park adopted some ecological restoration with low-impact development to regain its natural ecological functions and enhance biodiversity and offers high-quality public green space. The renovated park can fulfill leisure, physical fitness, and social community needs for a heterogeneous market audience and embed heritage culture into modern design, thereby providing an opportunity to reinforce local cultural identity.

Thus, the ultimate work done at Wukong Bridge Park would be highly educational to urban park renovation, as it shows how ecological restoration can be brought together with social needs whilst respecting historical and cultural legacies. This project is a good example for urban public space design and refurbishment in the very near future and a great paradigm for the sustainable form of development.

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