

Innovative Design Models of Urban Green Spaces: Projects of Jiaxing Southwest Lake Park and Xi'an Zaohe Sponge River in China

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FEATURES

Skywalk; Public Space; Urban Nature; Regional Tourism; Sponge City; Urban Drainage; Naturalizing River; Green Sponge; Nature-based Solutions; Climate Resilience; Urban Flood

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1 Introduction

Urban environments worldwide are confronted with increasing challenges of balancing development with ecological preservation. Urban design for climate resilience and urban flood regulation is particularly crucial in densely populated areas with limited

green spaces. Two remarkable projects in China, the Jiaxing Southwest Lake Park and Xi'an Zaohe Sponge River, exemplify how innovative landscape design and sustainable practices can transform urban landscapes. Both of them aim to rejuvenate natural habitats, integrate recreational spaces, and improve residents' quality of life, while addressing environmental concerns.

2 A "Sky Web": Jiaxing Southwest Lake Park

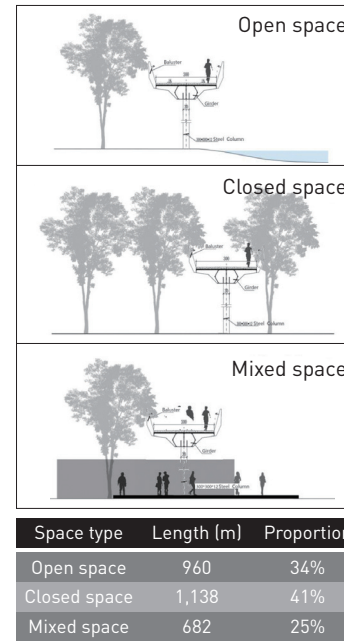
2.1 Project Statement

At the heart of Jiaxing City of Zhejiang Province in China, a web of skywalks provides a public space that floats above well-established wetlands and forests. The design protects and enhances the important oasis of urban nature and a major flood regulating space from the impact of large numbers of visitors,



- 1 Skywalk
- 2 Service center
- 3 Café and bookstore
- 4 Waterfront viewpoint
- 5 Dragon boat bleacher
- 6 Railroad-crossing bridge
- 7 Parking lot
- 8 Railroad
- 9 Constructed wetlands
- 10 Children's playground
- 11 Pavilion

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1. Aerial view of Jiaxing Southwest Lake Park, which protects the urban nature, connects adjacent neighborhoods, and accommodates the growing regional tourism.
2. Site plan of the park.
3. Three types of spaces around the skywalks.
4. The park connects adjacent neighborhoods.
5. The skywalks connect the tourist district to the east, across a busy railroad.

while addressing local communities' recreational demands and accommodating growing regional tourism. The "sky web" is integrated cafés, shops, playgrounds, pavilions, and other service facilities, creating a unique public space floating above the tree canopy.

2.2 Challenges and Objectives

Jiaxing lies on the east coast of China, centered between the cities of Hangzhou, Suzhou, and Shanghai. The city center is home to a densely afforested green space

called Southwest Lake Park (Xi'nianhu Park). Though being part of the 5-square-kilometer Nanhu Scenic Area, which sees more than 10 million visitors annually, the park site is functionally isolated from both adjacent neighborhoods (surrounded by water on the other three sides) and the thriving tourism district (cut off by a busy railroad on the east). Wet and densely vegetated, the site offers tremendous potential for bringing nature back to the city's urban heart, as well as providing significant flood regulating

capacity. However, the substantial and increasing tourism demands, along with the recreational needs of local residents, pose challenges to the maintenance of natural attributes of this isolated, semi-wild landscape.

2.3 Design Strategies

To solve these problems, a web of skywalks, totaling 3 km in length, was designed to connect the tourist district to the east, across the railroad right-of-way, with the communities to the west, across



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the water. Running through dense forest canopies, not a single tree was cut during its construction. The skywalks, averaging 4 or 5 m above the ground and 3 m wide, allow trees to rise from both sides and grow through the deck surface, creating an immersive atmosphere. Painted bright red, the steel structure stands in vivid contrast to the green surroundings.

Children’s playgrounds, cafés, bookstores, pavilions, and resting spots are integrated into the skywalk web. One of the playgrounds is a trampoline-style net hanging over the tree canopy, surrounded by seating for parents and children to interact closely. In some sections, reinforced glass flooring affords visitors a view straight down to the ground. A web-based interpretative system, accessible via mobile phone, helps visitors learn more about both the natural life in the tree canopy and the city’s skyline, offering a new perspective to residents normally confined to flat and narrow streets in the city.

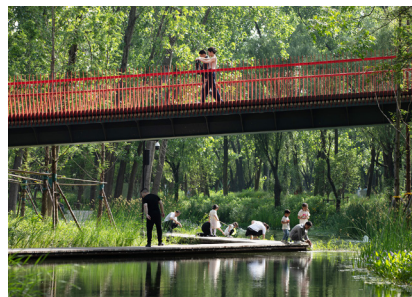
Beneath the canopy and the web, the redesign interventions include diverting water into the constructed wetlands to demonstrate the water filtration services that urban nature can provide. Stairs connect the skywalks to a network of paths, offering visitors an immersive nature-exploration experience in the “messy” undergrowth and wetlands.

The park has proved a great success. In its first year alone, the once-isolated and abandoned green space has become one of the most visited places in the city. Just in the first month after the park’s opening in January 2021, daily visits grew to 100,000—necessitating police intervention to manage the large inflow of visitors. The park has not only increased the local carrying capacity for tourism and flood resilience, but also helped improve the integrity of the natural habitats within it. Since its opening, its ecosystems have dramatically improved: nutrient-rich urban runoff is now filtered through the constructed wetlands, and the biodiversity of native flora has increased. The park demonstrates that innovative design can strike a balance between human and natural needs in highly urbanized environments.

6. The skywalks create an immersive atmosphere, where the bright red contrasts with the green surroundings.
7. Children’s playground: a trampoline-style net.
8. The redesign channels water to wetlands, highlighting urban nature’s function of filtration.
9. A diverse system reflecting the affinity for water.
10. Paths beneath also offer an immersive nature-exploration experience.
11. Waterscape platform with landscape structure.



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12. Immersive pathways with bio-swales for environmental engagement in the project of Xi'an Zaohe Sponge River.

3 Xi'an Zaohe Sponge River: Reinventing Urban Waterways in a Concrete Jungle

3.1 Project Statement

The Xi'an Zaohe Sponge River project in Shaanxi Province of China epitomizes the concept of a sponge city within a concrete urban framework, redefining urban waterways from overlooked and polluted channels into dynamic ecological veins. By fusing stormwater management

with the enhanced public spaces, this initiative revitalizes the Zaohe River, tackling pollution and the critical need for green spaces in densely populated areas. With the introduction of innovative urban greenways, ecological purification methods, and pedestrian-friendly designs, the project aims for more than environmental rejuvenation, aspiring to significantly improve community living standards and set a benchmark for sustainable urban development.

3.2 Site and Context

Nestled in the heart of Xi'an, celebrated for its storied "Eight Waters Surrounding Chang'an," stands the Zaohe River. This vital tributary of the Weihe River meanders through the Xi'an Hi-Tech Industries Development Zone and Yanta District. Between 2005 and 2017, the river underwent a profound transformation from a mere seasonal stormwater conduit to a critically polluted waterway, a change attributed to extensive channel



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13. Underground culvert concealed beneath the pavement, revealing significant infrastructure challenges.
14. Concrete channel issues highlight complexities in surface water management and access.
15. Southern site plan: valleys were designed to enhance flood control and improve access around culverts.
16. Section of the southern site.

modifications. In April 2020, in a significant move towards ecological rehabilitation, local authorities resolved to separate stormwater from wastewater, a decision that underscored a deep commitment to restoring the river's health. This task, deemed crucial for the river's ecological revival, was entrusted to landscape architects. With wastewater now diverted through a dedicated sewage pipeline and treatment facilities, the focus shifts to the ecological restoration of the former concrete channels. The initiative tackles two initial challenges related to drainage: addressing an underground, concealed drainage culvert and transforming an open concrete channel.

3.3 Goals and Challenges

The project aims to reinvent the Zaohe River as a vibrant ecological waterway. It envisions integrating recreational, cultural, and educational spaces within the urban matrix to restore the river's life force, supported by slow traffic and varied leisure zones. However, this vision encounters several challenges: 1) inadequate water flow capacity for safety and flood prevention; 2) poor water quality from historical industrial pollution and urban runoff; 3) a scarcity of green and recreational spaces, worsened by high-density urban development; and 4) a fragmented transportation network.

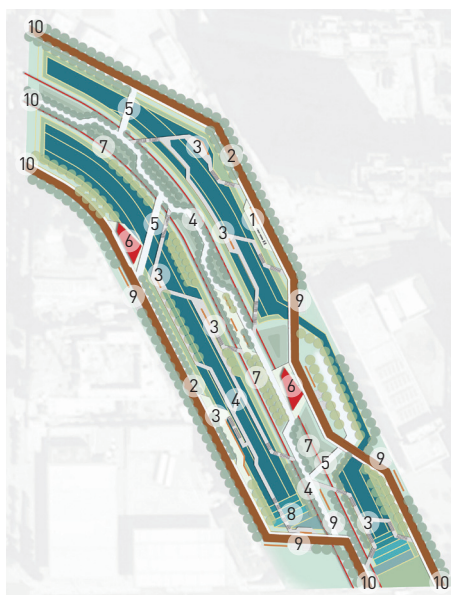
3.4 Design Strategies

3.4.1 Sculpting Urban Valleys

Given the pre-existing condition of buried drainage, one or sometimes two valleys were sculpted to manage stormwater on either side of the culvert, keeping the original culvert as a potential urban flood drain. In scenarios with open concrete channels and inaccessible slopes, vertical living walls were created to clean contaminated runoff, providing accessible wetland valleys for excess stormwater drainage. As a result, three linear, vegetated, and accessible valleys were established for public access, interconnected in a way that encourages exploration.

3.4.2 Utilizing Natural Terrain

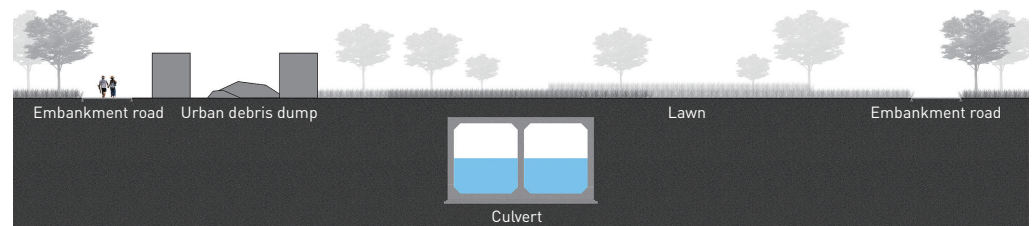
This strategy crafts unique landscaped areas with terraced gardens and wetland plants to enhance biodiversity and purify water. It transforms the vicinity into a verdant, absorbent urban area that also functions as a rewilded garden amidst the urban sprawl.



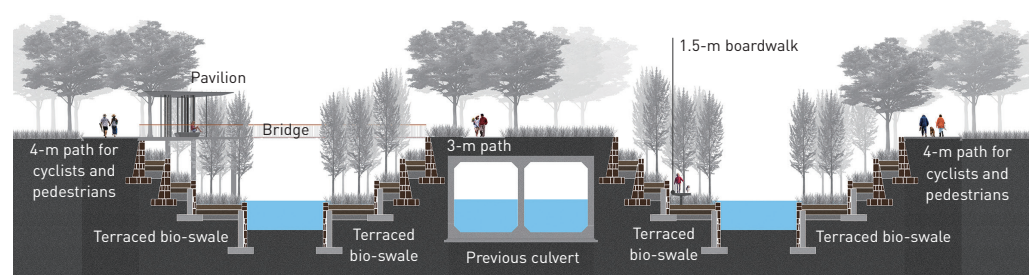
- 1 Sports ground
- 2 Bike lane
- 3 Waterside platform
- 4 Boardwalk
- 5 Bridge
- 6 Pavilion
- 7 Previous box culvert wall
- 8 Terraced bio-swale
- 9 Bike parking space
- 10 Guide sign

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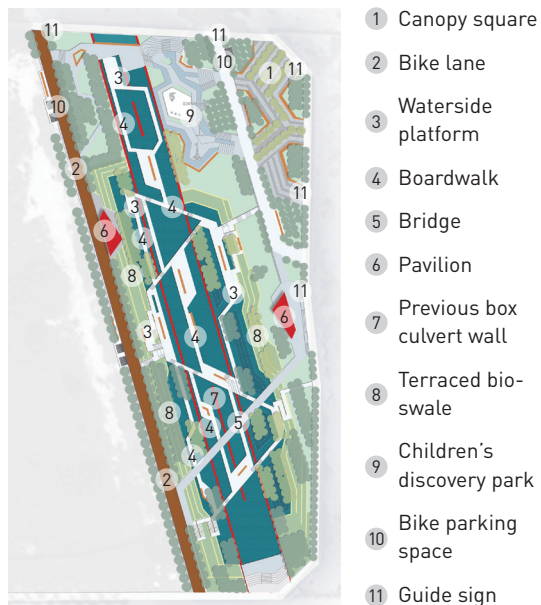
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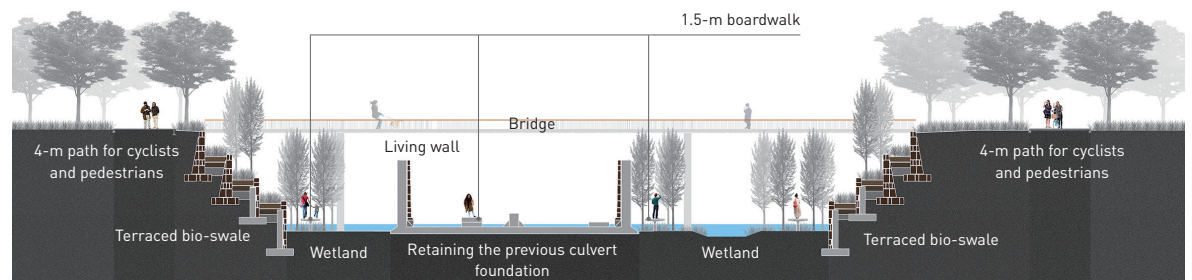
Design section



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- 17. Northern site plan: channel walls were transformed into vertical living walls, creating accessible wetland valleys for stormwater drainage and biodiversity increase.
- 18. Section of the northern site.
- 19. Terraced gardens with pedestrian paths embody an urban valley strategy.
- 20. Culverts were revitalized with ecological and functional valleys.
- 21. Bridges and boardwalks improve accessibility and flood preparedness.



3.4.3 Designed Ecologies and Stormwater Management

This method boosts ecological resilience through stormwater management, restoration techniques, and wetlands for natural filtration, encouraging native vegetation sustained by urban runoff and enriching the terraced riverbanks. Materials from demolished concrete walls were repurposed on-site to construct permeable pavements and path bases.

3.4.4 Integrated Pedestrian Paths and Public Spaces

A comprehensive slow traffic system introduces greenways, pedestrian bridges, riverside walkways, and boardwalks at various levels, ensuring seamless connectivity and meeting emergency and flood prevention standards.

density, this project demonstrates the feasibility of integrating green, sponge-like infrastructure within a densely populated setting, thereby expanding public spaces. The revitalization of the Zaohe River aims to restore its ecological health, enhance water management techniques, and improve flood defenses, significantly increasing recreational and leisure opportunities. Beyond environmental restoration, this project addresses the community's unique

3.5 Green Solutions in the Dense City

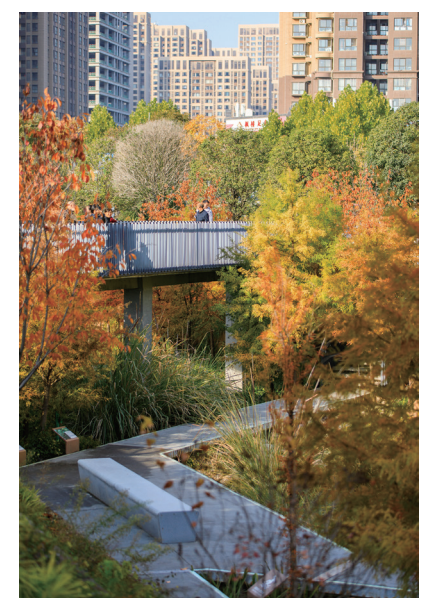
Despite the challenge of high urban



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recreational and cultural needs, marking the development of a distinctive and unparalleled urban greenway.

4 Conclusions

Both projects reveal the profound impact of innovative urban design on ecological and community well-being. By integrating natural elements with public amenities, they enhance biodiversity, improve environmental health, and create vibrant, accessible recreational spaces. These initiatives serve as benchmarks for sustainable urban development, illustrating how cities can harmoniously blend human needs with nature conservation, to ultimately foster healthier and more resilient urban communities.

Competing interests | The author declares that he has no competing interests.



22. Rewilded nature encourages community engagement and ecological balance.

Project Name: Jiaxing Southwest Lake Park
Location: Jiaxing City, Zhejiang Province, China
Size (area): 40 hm²
Client/Owner: Jiaxing Municipal People's Government
Landscape Architecture: Turenscape
Principal: Kongjian Yu
Design Team: Hongqian Yu, Minghui Ban, Peng Zhou, Yuan Fang, Rui Wang, Hui Tong, Zhoulin Zhang, Fan Zhang, Yunying Chen, Xiu Guo
Design Time: 2019
Completion Time: 2021



23. The previously lifeless, inaccessible concrete culvert has been transformed into a vibrant community space.

Project Name: Xi'an Zaohe Sponge River
Location: Xi'an, Shaanxi Province, China
Size (area): 3.95 hm²
Client: Xi'an Hi-tech Software New City Construction and Development Co., Ltd.
Landscape Architecture: Turenscape
Principal: Kongjian Yu
Design Team: Shuiming Zhou, Bingyue Zhang, Binyi Liu, Yao Lu, Banzhu Yao, Zhewei Hu, Xiao Jin, Tianyi Zhang, Hao Chen, Ying Xu, Qiuhan Kong
Design Time: June 2020
Completion Time: January 2021

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城市绿色空间的创新设计典范： 嘉兴西南湖生态公园与西安皂河海绵河道项目

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项目关键词

人行天桥；公共空间；城市中的自然；区域旅游；海绵城市；城市排水；河流自然化；绿色海绵；基于自然的解决方案；气候韧性；城市内涝

编辑 王颖

项目名称: 嘉兴西南湖生态公园

项目地点: 中国浙江省嘉兴市

项目面积: 40hm²

项目委托: 嘉兴市人民政府

景观设计: 北京土人城市规划设计股份有限公司

首席设计师: 俞孔坚

设计人员: 俞宏前、班明辉、周鹏、方渊、王瑞、佟辉、张洲林、张璠、陈赟英、郭秀

设计时间: 2019年

建成时间: 2021年

项目名称: 西安皂河海绵河道

项目地点: 中国陕西省西安市

项目面积: 3.95hm²

项目委托: 西安高科软件新城建设开发有限公司

景观设计: 北京土人城市规划设计股份有限公司

首席设计师: 俞孔坚

设计人员: 周水明、张冰月、刘斌毅、鲁遥、姚斑竹、胡哲维、金潇、张添翼、陈昊、徐颖、孔秋晗

设计时间: 2020年6月

建成时间: 2021年1月