

Landscape Design Practice of "Ecological Restoration and Cultural Inheritance" in Industrial Heritage Site Renewal

Chenxi Wang

Shenzhen General Institute of Architectural Design and Research Co., Ltd., Hefei Branch, Hefei, Anhui, 230000, China

Keywords: Industrial Sites; Ecological Restoration; Cultural Heritage; Landscape Architecture; Urban Regeneration

Abstract: Linking the reuse of industrial built-up space with urban transformation and development as part of the industrial restructuring: The case of Malmo Abstract: Industrial sites are exposed to renewal contexts due to urban transformation, redevelopment and/or industrial restructuring processes. Based on the core value of integrating ecological restoration and cultural heritage, this paper takes typical cases, such as Donlica Changchun Water Culture Ecological Park, Zoucheng Ferroalloy 1971 Industrial Site Park in Jining. Focusing our inquiries through the lens of landscape architecture, it investigates how industries can be rethought across open space and fills, with strategies for spatial rejuvenation, recoding utility programs and reconstruction processes. This study further clarifies theories and methodologies of these novel designs guided by the concept of "minimum intervention principle," and is expected to offer theoretical supports and practical reference for promote sustainable approaches in the site development.

1. Introduction

Industrial sites are important carriers of urban development history and have profound historical, cultural value and unique spatial memory. However, with industrial relocation and restructuring urban functions, many of these sites are abandoned and idle. It causes not only the waste of land resources but also environmental pollution. Thus, the question of how to realize sustainable reuse of industrial sites by restoration and repairing the environment while at the same time retaining industrial culture has never been more important for contemporary urban regeneration.

2. Theoretical Basis and Value Orientation for Industrial Site Redevelopment

The challenge in redeveloping industrial heritage is to mediate a balance between culturally preserving and developing which allows both historical value (i.e. memory) and utility (in terms of the economy and community) to come together organically [1]. In theory, the transformed industrial relics should conform to the basic principle of "all-side preservation, proper development and suitable adaptive reuse. Explore the historical preservation of industrial heritage on one hand; and the practical needs of urban development on the other. Here, ecological restoration and cultural inheritance help and enhance each other, jointly creating sustainable urban space. On this basis, ecological restoration moves the concept of green development to industrial sites and improves environmental quality, while cultural inheritance maintains continuous and effective in-situ reproduction capabilities for urban context elements, making the space more recognizable and reinforcing its identity.

This thought is fully embodied in the redevelopment practice of Changchun Water Culture Ecological Park. This Project based on the former First Water Filtration Plant from Puppet Manchuria period, protecting 80 years of water supply culture. At the same time, it uses ecological restoration methods to turn 30 hectares of land in the city centre into ecological green space; Through the organic integration of industrial relics, natural landscape, culture, art and fashion creativity to realize the transformation from an enclosed industrial compound to an open public space has become a new oasis belonging to citizens leisure life.

3. The Necessity of Integrating "Ecological Restoration + Cultural Inheritance" in Landscape Design for Industrial Site Redevelopment

There are four dimensions in which the landscape design practice related to ecological restoration + cultural inheritance is embodied through specific operational arrangements. These four pathways are interrelated and mutually reinforce one another, together laying the groundwork for an integrated approach to industrial site redevelopment. The status of industrial material in landscape as symbolic representation is the key method of cultural inheritance, which has laid the foundation for continuing historical context hand in hand with transformation practice.

3.1 The Practical Demand of Urban Transition and Development

As China's economic restructuring and industrial upgrading are accelerating, a large number of traditional industrial enterprises have been relocated, leaving behind a lot of abandoned industrial sites. Sites like these, often located in prime urban space and full of strategic value, more commonly experience environmental woes such as soil contamination and outdated infrastructure. The "ecological restoration + cultural inheritance" landscape design between urban transformation and park construction is inseparable from the practical needs of urban transition behind it, so that abandoned industrial sites become urban green open space again. It is proved to improve the scarcity of land resource, promote urban eco-environment quality and meet the demands for sustainable urban development.

3.2 The Imperative for Ecological Environment Restoration

Factories that function are one of the major drivers in environmental pollution sites, potentially threatening the surrounding ecological environment and residents' health for a long time. Especially, soil heavy metals (HMs) are to be common contaminants found within industrial water, which originates from multiple sources like landfills and mining dumps. As an efficient method for enhancing sustainable environmental quality, ecological restoration by means of landscape design creates social and economic value beyond that of conventional environmental remediation remediations which are costly and yield small results. The ecological functions of the original ecosystem can be restored by using ecological technologies like phytoremediation, soil improvement and stormwater management methods, so as to build a stable system. Becoming a "greenfield" from a "brownfield" is an amazing turning point, but it is also the necessity of ecological environment restoration.

3.3 The Historical Responsibility of Cultural Value Inheritance

Industrial sites are the product of certain historical periods, and contains rich industrial cultural memory and socio-historical information, with irreplaceable cultural value. The industrial buildings, equipment and spatial layout they left behind witness the history of urban development over a long period time, reflecting both the technological levels and aesthetic ideas of each era, which is an important part of urban cultural relics. Seeing them languish or be torn down thoughtlessly would represent an irretrievable cultural loss. Not only could landscape design methods integrate industrial elements with modern functions to preserve the historical value of industrial cultural heritage, but they also meet the usage needs of contemporary society, achieving the living inheritance of history and culture. Such historical responsibility is the promise of heirloom of the value.

4. The Practice of "Ecological Restoration + Cultural Inheritance" in Landscape Design for Industrial Site Redevelopment

The "ecological restoration + cultural inheritance" landscape design practice within industrial site redevelopment, through systematic review and case analysis, showed that this design thinking can not only provide effective solutions for urban regeneration but also point to a sustainable development approach that reconciles historical preservation with modern development, as well as ecological restoration with cultural inheritance.

4.1 Inheriting Memory: The Symbolic Representation of Industrial Elements through Landscape

The received data up until October 2023 time frame Through the techniques of landscape design, these elements are transformed into features of the landscape to incorporate aesthetic and educational value based on designers' in-depth knowledge of the history and culture existing on site [2]. The design follows the principle of minimum intervention, keeping as much as possible of the original industrial structures and spatial textures while giving them with new functions and meanings in a smart manner. Not only preserving mere display of the industrial elements, but reinterpreting and presenting elements with a modern design language based on respecting authentic history. In this undertaking, designers examine the technical traits, aesthetic significance and cultural implications of industrial facilities, translating these metaphorical traces of industry into visceral spatial experiences. Moreover, signs system, cultural wall, interactive installation and other elements can enable historical industrial information delivery to the public, and constantly cultivate cultural interest, continuously strengthen its function of cultural education for space. In this sense, the solution not only carries on an urban industrial context, but also gives citizens a window to understand how their city evolved and what they have inherited for future developments - allowing once-dormant industrial heritage to instill energy in the present day.

The Changchun Water Culture Ecological Park makes good use of the characteristics of the plants to bring an industrial element to landscaping, which perfectly presents the design idea that represents industrial heritage in a symbolic way with landscape. The all-ages activity playground is filled with vibrantly interpreted industrial pieces from the plant. Its simple play facilities and rest areas echo memories of the industrial era, enabling citizens to feel the gravity of history even in leisure and recreation. The central lawn on top of the original clear water reservoir has been remade into a plaza suitable for cultural activities and artistic events, providing new cultural functions to what was originally industrial structure, and making it an important node of urban memory. Through the horizontal line interspersed by clear water and mist, a spatial sequence with different orientation and vision is constructed; the plaza horizontally connects functional divisions from sewage treatment units to sedimentation tank, clear water tank as well as the whole green corridor and campus owner mupai garden, including the Water Culture Museum cluster connected along pathways. Making the original water purification process a part of the landscape, the project allows visitors to learn about the history of the city's water supply as they walk through. With this, it combines industrial remains with natural landscape in a synchronized manner to form the cultural landscape both educating and aesthetically worthwhile.

4.2 Reshaping Space: The Three-Dimensional Corridor Touring Experience

It is the spatial remodeling which represents a key element for the successful resimplicit of industrial sites. At the heart of it is redefining previously enclosed industrial buildings into open public touring realms with creative design strategies [3]. Building a three-dimensional corridor system is an effective design method. In this way it not only connects different elevations of industrial structures and but also brings visitors a three-dimensional space experience. This design technique makes the visit simultaneously safe, comfortable, interesting and interactive.

The construction of such corridors needs to fully take into account the structural characteristics and spatial relationships of the industrial buildings. We ensure the safety and practicality of the corridor system through scientific structural calculation and rational path planning. At the same time, based on the choice of materials and design of form of construction space corridors guide as a whole industrial site reflects modern aesthetics of introduction should match with existing buildings to establish dialogue. The rational arrangement of the path and optimization design of nodes allow visitors to observe the charm of the industrial site from multiple angles, thus achieving a gradual experience from afar to near close-up contact and highlighting spatial hierarchy and dramatic effect.

The multi-disciplinary collaboration with the teams in architectural, landscape architectural, structural engineering and industrial heritage restoration make Jining Zoucheng Ferroalloy 1971 Industrial Site Park unique. This collaboration allowed for the implementation of an "intervention

traffic weaving"- (for secondary traffic) on preserved industrial buildings, illustrating a practice of innovation in three-dimensional corridor planning. At the project, an elevated walkway was created that provides access into the core industrial structures. This corridor is not only a solution for circulation between buildings of different levels, rather most importantly it creates unique viewing perspectives at the same time. With this corridor system and by opening up nodal spaces as well as including functional facilities like platforms, rest areas, and viewing decks in the tour have undoubtedly increased its attraction and comfort.

Not only can the people in a distance set their eyes on the panoramic view of the park core heritage area and admire its splendor (as an industrial site), but they also can introduce themselves into the interior of the ruins through this corridor system, and experience closely those similar industrial facilities. This three-dimensional excursion facilitates a robust spatial occurrence amongst patrons to experience industrial culture and the chronology of the site through interlocking dimensions for an integration of educational significance.

4.3 Integrating Nature: The Reconstruction and Cultivation of Ecosystems

Restoration is not simply greening and beautification; through the use of ecological principles, scientific plant configuration, and ecological technologies to reconstruct and cultivate the entire site ecosystem, it is a new systematic project for industrial sites. To create a stable ecological community and to restore/enhance ecological functions. It involves thorough analysis of various aspects such as soil properties, hydrological conditions, climatic factors and biodiversity.

When it comes to specific designs, we can use the topographic characteristics of site itself to configure vegetation between layers to create rich ecological habitats. It is important to choose species with high adaptability and ecological functions at the level of native species, then establish composite community structures through combination of trees, shrubs and herbaceous plants so that a stable ecological chain can be formed. At the same time, ecological technologies like stormwater management, soil remediation and microclimate regulation should be extended for building sustainable ecological cycles. This ecological revitalization not only enhances the site's environmental quality and reduces urban heat island effect (UHI), air, and water body purification but also acts as an important element of urban green infrastructure by granting major ecological functionalities to the city including carbon storage, biological habitats, and stormwater runoff retention.

Changchun Water Culture Ecological Park is an ecological green space carrier, which is based on the organic integration of industrial relics and natural landscape. The core of the city, not only creates the 300,000 square meters ecological green space, provide great ecological service for the urban area but also eases a lot of central urban area green space shortage problem and highly reflects design philosophy ecosystem reconstruction. Noteworthy in its design, were the open sedimentation tanks, which had been skilfully adapted as eco-hydrological water features to retain industrial memory and fulfil rainwater collecting and ecological purification tasks. The forest ecological corridor integrates the park's green spaces into a whole ecological passage, which has become small animals habitat and relatively free migration channels. Through this form, the project also emphasizes on plant seasonal characteristics and ecological function, forming a stable ecosystem through multi-level vegetation configuration.

4.4 Serving the People: Functional Implantation in Quality Spaces

Fundamentally, the goal of industrial site redevelopment is to improve citizens' lives by providing diverse high-quality public spaces and functional services. This not only requires designers to reasonably integrate contemporary life needs functional facilities such as leisure entertainment, cultural and educational places, sports and fitness areas on the basis of better preservation of industrial heritage.

We need to ensure that functions implanted in quality space around human-centered design, based on the behavior and needs of different users. Also, be emphasized in humanized design to create a comfortable and pleasant activity space at the spatial scale, excessive size of the scale will

bring inconvenience. Functional layout takes into account the overall user age of space, and also considers the profusion of service facilities to achieve all-age-friendly spatial design. Functional implantation also needs to emphasize spatial flexibility and adaptability, so that it can be used at different times and seasons. At the same time, designers should pay attention to universal accessibility design and safety measures so that all groups can enjoy the services provided by public space equally, which embodies social equity.

With its remarkable achievements in serving people's lives, the Zoucheng Ferroalloy 1971 Industrial Site Park is located in Jining. While a carefully interlocking pattern of building and landscape ensures that visitors feel comfortable in new nodal spaces on the project. Throughout the park, node formations themed to the factory's legacy and industrial culture are scattered as units of cultural commemoration. These designs create high-quality public spaces, with their comfortable scale, refined details, and natural landscaping. These also include a non-powered playground in the children activity area, seating areas in rest zones, and active leisure areas in small plazas that meet comprehensively the daily life needs of public.

5. Conclusion

As one of the modes for urban regeneration, landscape architectural practices focusing on "ecological restoration and cultural inheritance integration" contribute toward much-needed, theoretical groundwork and practical methods in the rehabilitation of industrial sites. Such as the use of landscape to symbolically portray industrial elements, realizing three-dimensional corridor touring experiential space, reconstructing cities and ecosystems while implanting functions into quality spaces, so as not only to achieve the effective protection of industrial cultural heritage but also to provide high-quality public space for cities.

With this in mind, the application of this philosophy should be more further promoted, interdisciplinary collaboration strengthened and related policies and regulations improved. Actually, this will help in successfully redeveloping more industrial sites that contribute actively to the progress of beautiful cities with a glorious ecological environment and high livability.

References

- [1] Luo Zhaojing. Research on the Design of Industrial Site Redevelopment from the Perspective of Post-Industrial Landscape [D]. Lanzhou University of Technology, 2024.
- [2] Yu Kun, Wang Yongqiang, Zhang Faping, et al. Research on the Comprehensive Utilization of Post-Industrial Sites of Decommissioned and Remediated Uranium Mines [J]. Uranium Mining and Metallurgy, 2022, 41(03): 302-308.
- [3] Xu Yanmei, Li Juanjuan. A Preliminary Study on the Typology of Landscape Design Forms Based on Idle Industrial Sites [J]. Modern Gardening, 2016, (17): 111-112.