

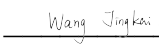
MINISTRY OF CULTURE AND STRATEGIC COMMUNICATIONS
KHARKIV STATE ACADEMY OF DESIGN AND ARTS
Faculty of « ENVIRONMENTAL DESIGN»
Department of «Environmental Design»

WANG JINGKAI

**TRANSFORMATION OF INDUSTRIAL HERITAGE SITES INTO
PUBLIC SPACES: DESIGN TECHNIQUES AND TOOLS**

Qualification work for obtaining the SVO «Master»
in the specialty 022 Design
OPP «Design of the architectural and landscape environment»

The qualification work contains the results of one's own research
The use of ideas, results and texts of other authors must be referenced to the
appropriate source.

 数字签名者: Wang
Jingkai
日期: 2025.11.16
15:30:26 +08'00'

WANG JINGKAI

Scientific advisor: Olena Sharlai
Candidate of architecture, professor of the Department of «DS»

Kharkiv-2025

CONTENT

INTRODUCTION.....	1
SECTION I. HISTORIOGRAPHY OF THE ISSUE.STATUS OF RESEARCH ON THE TOPIC.....	2
1.1. State of research on the topic.....	2
1.2. Research methods.....	6
<i>Conclusions to the first chapter</i>	9
SECTION II. MODERN APPROACHES TO THE TRANSFORMATION OF INDUSTRIAL HERITAGE SITES.....	10
2.1 Methods for transforming industrial sites into public spaces (reconstruction, restoration, valorization, etc.)	10
2.2. Universal design requirements in the spatial organization of public spaces...	15
2.3. Basic methods of forming public space design	17
<i>Conclusions to the second chapter</i>	23
CHAPTER III. DEVELOPMENT OF AN EXHIBITION SPACE PROJECT BASED ON THE PRINCIPLES OF SPATIAL NAEATIVE THEORY	25
3.1. CONCEPT.....	25
GENERAL CONCLUSIONS.....	28
REFERENCES.....	30
APPENDIXA. Visual material for the text.....	35
APPENDIX B. Tables, diagrams.....	39
APPENDIX C. Project proposal.....	47

INTRODUCTION

With the advancement of urbanization, many industrial heritage sites have gradually been abandoned due to industrial transformation, technological progress, or the weakening of their functions. Industrial heritage refers not only to the factories, warehouses, boiler rooms, and other facilities that have lost their original functions and been abandoned, but also to the rich historical memories, social relationships, and cultural values they carry. These sites are witnesses to industrial civilization, encompassing multidimensional values such as history, technology, architecture, and society. Particularly in the context of rapid modern societal development, how to preserve the unique cultural value of industrial heritage while transforming it into modern urban public spaces has become an important issue in urban regeneration worldwide.

In this context, the transformation of industrial heritage is not simply a process of repairing or demolishing old facilities, but rather a continuation of culture and history. Through adaptive reuse, industrial archaeology, narrative display, and landscape-first renovation, industrial heritage can be revitalized and provide new public spaces for the city, promoting cultural integration and sustainable development in society.

Globally, many countries have already initiated the transformation and reuse of industrial heritage, providing valuable references for such practices. Against the backdrop of global sustainable development, the reuse of industrial heritage is not only necessary for cultural preservation but also an important measure to address climate change and enhance urban ecological quality. Through appropriate design and renovation, industrial heritage can not only preserve the historical memories of the city but also offer more cultural, ecological, and social value to future urban spaces.

The purpose of this research is to explore how to transform industrial heritage into public spaces rich in historical significance, cultural connotation, and

multifunctionality through the design approach based on spatial narrative theory. By analyzing relevant design techniques and tools, this study aims to provide effective strategies and design frameworks for the transformation of industrial sites, offering practical guidance for urban regeneration and cultural heritage preservation.

1.1. State of research on the topic

Industrial heritage generally refers to industrial sites, factory buildings, warehouses, and related spaces that have been abandoned or left idle due to a reduction or cessation of industrial activities. These sites are the result of industrial transformation, technological progress, or urban functional adjustments, which lead to the gradual abandonment or degradation of industrial land and buildings. Industrial heritage includes not only the physical remnants of industrial structures but also carries historical memories, social relations, and cultural values. It is a collective term for both tangible and intangible legacies related to industrial civilization, encompassing historical, technical, social, architectural, and scientific values. This includes physical assets such as factories, workshops, warehouses, mines, smelting and power facilities, transportation and logistics infrastructure, as well as associated worker communities, social welfare facilities, archival documents, oral histories, and craft knowledge.

Industrial heritage often features the loss of functional utility, no longer serving its original production or manufacturing role. However, it holds great potential for adaptive reuse into public, cultural, creative, or residential spaces. It is characterized by both its rich diversity and the fact that it spans various types of facilities, including heavy industry, light industry, storage, and transportation, reflecting both typical and diverse industrial characteristics. As an important thread for understanding modern social formation mechanisms, industrial heritage links "technology—production—city—society": from energy extraction, raw material transportation, processing, manufacturing to product shipment, the industrial system is closely integrated with spatial networks like water systems, railways, and ports, shaping unique urban forms and regional landscapes. Therefore, the understanding of industrial heritage should not remain at the level of individual buildings but should be examined in a broader context of "industrial landscapes" and social-cultural settings.

Internationally, the research and practice surrounding industrial heritage have developed into a well-established framework. The United Nations 2030 Agenda for Sustainable Development sets 17 specific goals for global sustainable development, covering various dimensions including economic, social, and environmental aspects, emphasizing the harmony between human society and the natural environment and the importance of sustainable development. This agenda aims to address global challenges such as poverty, inequality, and climate change through global cooperation, promoting coordinated development in economic, social, and environmental spheres. The Paris Climate Agreement focuses on addressing climate change, proposing the goal of limiting the global average temperature rise to well below 2°C, and striving to limit it to 1.5°C above pre-industrial levels. To achieve this goal, countries are required to take active and effective emission reduction measures, promote energy transformation, and strengthen climate change adaptation capabilities. Against this international policy backdrop, the reuse of old industrial sites has become a key initiative not only for urban functionality optimization but also for responding to global sustainable development challenges.

In China, with the rapid pace of urbanization, traditional industrial zones are gradually relocating or closing, leaving behind a large number of industrial heritage sites. At the same time, the rapid population increase and economic development driven by urbanization have led to explosive growth in urban land demand, creating intense land resource shortages. The challenges posed by land use due to population growth are increasingly severe. Looking back at the 1990s, China was in a stage of rapid economic development and large-scale urban construction, with more focus on short-term interests and quick economic growth. In this context, there was minimal attention paid to the cultural and historical value of traditional industrial heritage sites, leading to demolition and rebuilding as the primary approach for their transformation. However, old industrial sites serve as physical witnesses to the urban industrial development process, carrying the industrial culture, production techniques, and collective memories of specific historical periods. Demolishing them is akin to tearing out the pages of a city's history book, leading to a break in cultural continuity and making it difficult for future generations to directly experience and understand the industrial development narrative. Different regions' old industrial sites, influenced by local resources and culture, have unique styles and cultural imprints. Large-scale demolition would cause cities to lose these unique markers, leading to homogeneity and diminishing residents' sense of cultural identity and belonging.[1]

In 2017, the Ministry of Industry and Information Technology of China, in collaboration with the State Administration of Cultural Heritage and the National Development and Reform Commission, initiated the "China Industrial Heritage Protection Directory," a key cultural heritage preservation project. As a significant participant in the global industrialization process, China's modern industrial heritage holds crucial historical memories of the nation's industrialization and modernization. With the acceleration of traditional industrial transformation and urban renewal, many industrial heritage sites face demolition or neglect, requiring systematic protection. The launch of the "China Industrial Heritage Protection Directory" project not only recognizes the physical remains but also honors the "human struggle" during the industrialization process. It marks China's transition from being an "industrial power" to a "strong industrial cultural nation." Future efforts should focus on policy refinement, technological integration, and social co-governance to ensure that industrial heritage becomes a true bridge connecting history and the future. Subsequently, in 2020, 2021, 2023, and 2025, policies such as the "Implementation Plan for Promoting the Protection and Utilization of Industrial Heritage in Old Industrial Cities," the "Notice on Preventing Large-Scale Demolition and Reconstruction in Urban Renewal," the "National Industrial Heritage Management Measures," and the "Opinions on Continuing to Promote Urban Renewal Actions" were released to promote the rational development of China's industrial heritage-related work.[2]

The theoretical development of industrial heritage has a long history. In the mid-20th century, industrial heritage terminology was in its early stages, coinciding with the "de-industrialization" wave in Europe and North America, where industries were in decline, and governments were shutting down enterprises on a large scale. During this period, many industrial heritage sites were considered spaces without reuse value, with terms such as "abandoned industrial land," "idle factories," "industrial ruins," and "vacant industrial land" carrying negative connotations, emphasizing their uselessness or decay. By the 1980s and 1990s, the definition of industrial heritage began shifting towards a transformation-oriented perspective. Western countries started focusing on sustainable urban development, and industrial heritage became an important topic. Terms like brownfield, abandoned industrial land, and old industrial sites emerged, highlighting issues like pollution remediation and redevelopment potential. By the late 1990s and early 2000s, industrial heritage terminology entered a cultural recognition phase. Terms like "industrial landscape" and "urban memory space" gained traction as countries began to value the cultural significance of industrial civilization. This led to the rise of "industrial heritage preservation," focusing on the historical value,

architectural features, and cultural symbolism of industrial sites. In the 21st century, the terminology evolved into a phase of comprehensive development. At this stage, countries began emphasizing urban renewal, space regeneration, and urban design revival, fostering the activation and redevelopment of spaces, with terms like urban renewal land, regenerative space, and reused industrial spaces reflecting a neutral and complex approach, focusing on functional transformation, historical value exploration, and cultural innovation.

The concept of industrial heritage has evolved from a negative perception (such as abandoned land) to a more neutral or even positive understanding (such as heritage and regenerated space). Its associated terminology has expanded to cover environmental governance, historical preservation, urban renewal, and cultural creativity, reflecting the growing recognition of spatial value and the shift in urban development concepts.

The value of industrial heritage lies first and foremost in its unique function as a historical witness. It records the entire process of a city's transformation from agriculture to industry, and then to post-industrialization, through tangible elements like factories, workshops, mines, and transportation and power facilities. It links significant events such as technological revolutions, industrial shifts, wartime mobilizations, and institutional changes. Unlike traditional documents, these remnants convert abstract history into readable space and structure, allowing researchers to reconstruct production logic and organizational methods from details like layout, workflow, equipment foundation, and transportation paths, helping us understand how modern society has been reshaped by productivity and technological advancement. This historical and technical value intertwines with architectural and aesthetic significance. Large-span steel structures, sawtooth roofs, long continuous windows, trusses, and the material textures of brick, steel, and concrete collectively form a recognizable industrial typology and aesthetic. They are both "frozen samples" of engineering and materials science and sources of inspiration for spatial design. Preserving the original structure and texture while using minimal intervention for reuse not only continues the spirit of the site but also accommodates functions like exhibitions, education, public services, and innovative offices, demonstrating the design methodology of "structural readability and spatial plasticity."

Industrial heritage also carries significant social and anthropological value. Public facilities such as worker dormitories, canteens, baths, clubs, and schools, which accompany production facilities, reflect social histories related to labor relations, welfare systems, migration and settlement, gender, and class. The preservation of

oral histories, archives, and objects helps reconstruct the details of "everyday life," strengthening local identity and collective memory. In the transformation into public spaces, through narrative tours, interactive displays, and community involvement programs, industrial heritage can become a platform for public discourse and social cohesion, promoting intergenerational communication and social inclusivity. From the perspective of urban and landscape design, industrial systems are closely integrated with water systems, railways, ports, energy, and raw material corridors, often shaping unique waterfront spaces, corridor networks, and district textures. Transforming such heritage into parks, greenways, and cultural corridors can reshape slow-traffic systems and open space frameworks without large-scale demolition, enhancing accessibility and publicness, and driving regional renewal with minimal cost. This process is closely related to ecological and low-carbon values: prioritizing preservation and reuse significantly reduces the embodied carbon and construction waste associated with new construction; through brownfield restoration, stormwater management, and vegetation reconstruction, we can transform "environmental liabilities" into "public ecological assets," achieving triple gains in environmental governance, public health, and spatial quality.

The value of industrial heritage is not unidimensional but a complex coupling of historical, technical, architectural aesthetics, social anthropology, urban landscape, ecological low-carbon, and economic innovation. Only through a holistic perspective for identification and assessment, and by following principles of "light intervention, reversibility, readability, low-carbon, and publicness," can these remnants be truly transformed into high-quality public spaces and a lasting driving force for urban renewal through professional design, ecological restoration, community participation, and long-term operation.

1.2. Research methods

This study, titled "Transformation of Industrial Heritage Sites into Public Spaces: Design Techniques and Tools," focuses on the Jiangnan Cement Factory in Nanjing as the core case study. The overall methodology adopts a triangulation strategy, combining literature review, case analysis, and field investigation. The literature review is used to construct the theoretical framework and indicator system, while case analysis of similar projects both domestically and internationally helps to extract reusable design techniques and implementation

paths. The framework's adaptability and effectiveness are then verified through a multi-dimensional field investigation of the site, ultimately leading to the development of transformation design strategies and a toolkit tailored for this specific site.

● **Literature Review Method**

The study will focus on themes such as "Industrial Heritage Preservation and Reuse," "Industrial Landscapes and Brownfield Remediation," "Typology of Cement Industry Heritage," and "Public Space Design Techniques and Operational Tools." By systematically reviewing and analyzing relevant domestic and international literature, the research will establish a solid theoretical framework and practical support for the paper. The study will involve searching academic databases (such as Google Scholar, CNKI, etc.) for papers, books, and case reports related to industrial heritage, industrial site reuse, green design, and multifunctional development. Through comprehensive data collection, the research ensures that it covers both international and domestic advanced practices and theoretical achievements. By reviewing the development context of industrial heritage definitions and comparing the experiences of industrial site redevelopment at home and abroad, the study will clarify the regenerative value of these spaces in ecological, cultural, social, and economic aspects. Based on the literature analysis, the research will construct a systematic theoretical framework, providing scientific foundations for the design study of the Jiangnan Cement Factory industrial heritage. This will ensure that the research outcomes address key practical issues, enhancing the theoretical innovation and practical applicability of the study.

● **Case Analysis Method**

In this study, the case analysis method will be employed by examining typical projects that share similar characteristics with the Jiangnan Cement Factory, providing practical references for the design study of the site. Industrial heritage transformation cases, both domestic and international, that are comparable to

Jiangnan Cement Factory will be selected, prioritizing projects that include key structures such as large-span factory buildings, rotary kilns/clinker silos, conveyor bridges, and towering chimneys, which have undergone successful transformation into public spaces. A unified template will be used for analysis, covering the following aspects: project background, preservation strategies and intervention intensity, spatial organization and circulation, ecological restoration and safety upgrades, design methodology, and implementation process. Through horizontal comparisons, transferable combinations of "design techniques—implementation steps—management and operations" will be extracted, along with their applicable boundaries and potential risks, and the practical experiences that can be adapted to the Jiangnan Cement Factory site.

Through case analysis, the study will clarify how to preserve the historical context of industrial heritage while flexibly introducing modern functions, ensuring the harmonious coexistence of old and new elements. Additionally, the research will explore how to prevent the negative effects of gentrification through community and public space development, fostering social integration and inclusive growth. Horizontal comparisons between different cases will help identify commonalities and differences across projects, providing optimized strategies for the Jiangnan Cement Factory site tailored to its specific context.

Ultimately, the case analysis will provide scientific foundations and innovative insights for the design proposal of this research, and will validate the feasibility and scalability of the proposed solutions. This process not only ensures the practical value of the proposal but also offers systematic pathways and guidance for future similar projects, laying the foundation for the sustainable development of the region and city.

● **Field Investigation Method**

A multi-dimensional field investigation will be conducted around the Jiangnan Cement Factory. First, the study will focus on surveying its morphological

structure, mapping the locations of key architectural components, and documenting the scale, ceiling height, and structural system of the factory buildings. The preservation status and readability of facilities such as the rotary kiln, raw material mills, clinker silos, conveyor bridges, and chimneys will be recorded, along with the overall texture and corridor relationships. Second, an environmental and ecological evaluation will be carried out, assessing the boundaries of roads and water bodies, existing green spaces and shaded areas, as well as the direction of stormwater flow and potential spaces that could be transformed into ecological facilities. Third, the public behavior of the surrounding community will be observed, including pedestrian flow during different time periods, access routes to nearby communities, length of stay, and activity types. The results of these investigations will be synthesized to provide support for the design research.

Conclusions to the first chapter

1. This study examines the transformation of industrial heritage sites into public spaces, with a focus on the Jiangnan Cement Factory in Nanjing as the core case study. The research integrates multiple methodologies—literature review, case analysis, and field investigation—to create a comprehensive framework for understanding and implementing adaptive reuse strategies for industrial heritage.
2. Through the literature review, the study explores the key concepts of industrial heritage preservation, typologies, brownfield remediation, and the importance of public space design in the context of sustainability and urban regeneration. This process helps establish a solid theoretical foundation and provides practical guidance based on global and domestic practices.
3. The case analysis method further refines this approach by examining similar projects, extracting transferable design techniques and implementation steps, and addressing potential risks and applicable boundaries for the Jiangnan Cement Factory site

4. The field investigation method provides valuable insights into the physical and ecological conditions of the site, as well as the social dynamics of the surrounding community. This hands-on approach ensures the adaptation of design strategies to the specific needs and challenges of the Jiangnan Cement Factory, ensuring that modern functions can be integrated while preserving the site's historical and cultural essence.

Overall, the research outcomes will provide both theoretical innovation and practical applicability, offering a systematic design approach that ensures the transformation of the Jiangnan Cement Factory into a functional, sustainable, and culturally rich public space. The results of this study will serve as a model for future industrial heritage reuse projects, contributing to urban sustainability and preserving the cultural identity of industrial heritage sites.

SECTION II. MODERN APPROACHES TO THE TRANSFORMATION OF INDUSTRIAL HERITAGE SITES

2.1 Methods for transforming industrial sites into public spaces (reconstruction, restoration, valorization, etc.)

- **Adaptive Reuse:**

Adaptive reuse is one of the core methods for transforming industrial heritage into public spaces. It emphasizes preserving the original structure and historical characteristics of the building while introducing new functions. Original industrial facilities such as factories, warehouses, and boiler rooms are transformed into public spaces. The approach prioritizes minimal intervention, with the principle of "repair, not demolition; add, not replace." Additionally, the design should be readable, meaning that the new and old materials should be distinguishable, with intentional differentiation in materials, details, color, and techniques. The design should also ensure compatibility, where the new structures, materials, durability, fire protection, and acoustics match the performance of the existing buildings, without overburdening the original structure.[3]

Before design work begins, a systematic value assessment of the existing buildings on the site should be conducted to determine which parts can be preserved and which areas can be modified. The revitalization design should focus on adapting the buildings to their original forms, ensuring the transformation does not entail a complete overhaul. For representative structures such as factory buildings, silos, chimneys, and conveyor bridges, adaptive reuse should be prioritized—preserving load-bearing systems and material textures as much as possible, and adding reversible, lightweight extensions to introduce new functions while maintaining the character of industrial heritage. Appropriate restoration and reinforcement should be carried out to preserve the historical and cultural value of the buildings. New structures should be self-contained, using independent steel frames for mezzanines, walkways, bridges, and observation platforms, avoiding large-scale welding or grooving on existing components to distinguish them from the original parts.[4]

Without damaging the original building, modern construction techniques should be applied to reinforce the structure, such as using steel structures for reinforcement and redesigning the space layout to accommodate new functional requirements. Structural reinforcement should ensure the existing buildings can support the functions and activities required in modern public spaces. Additionally, preserving the original materials such as concrete, steel, and brick enhances the industrial texture of the heritage. Appropriate restoration and reinforcement will maintain the historical and cultural value of the buildings.[5]

- Industrial Archaeology and Narrative Display:

The design process requires a comprehensive historical study of the industrial site, including its founding background, development history, past production processes, and products, especially identifying key historical milestones (e.g., technological innovations, important product manufacturing, and social changes). In-depth research into the functions of industrial buildings, equipment, and facilities is necessary to understand their role and significance in production. This step requires utilizing site measurements, archival materials, literature, old photographs,

and oral histories to clarify which parts are core industrial facilities and which areas hold cultural value.[7]

The historical context of the existing buildings should be summarized and reconstructed through industrial archaeology methods, rebuilding the production chain and daily activities, and weaving these elements into a walkable, experiential, and educational narrative path. Key nodes within the existing buildings should be selected as anchor points for transforming historical stories. The site should include visible mechanisms and tangible materials, such as retaining and repurposing existing buildings and using original materials for redesign to showcase the aging traces of the site. The design should respect the original spatial features of the site, ensuring that minimal interventions are used for restoration and reconstruction, preserving historical heritage while providing flexible spaces for new functions.[9]

- Landscape-First Transformation:

The transformation of industrial sites is often accompanied by landscape design optimization. Through landscape design, originally single-functional industrial areas can be converted into multifunctional public open spaces. Industrial sites frequently face issues of soil and groundwater contamination. The landscape-first approach should prioritize resolving pollution problems through techniques such as in-situ stabilization, soil replacement, and phytoremediation to remove or control harmful substances. These restoration measures help restore the natural function of the soil, laying the foundation for ecological recovery.[11]

When transforming industrial sites into public spaces, rainwater management and drainage systems are particularly important. Traditional hard surfaces tend to cause rapid surface runoff, leading to urban flooding. By incorporating permeable paving, sunken green spaces, rain gardens, and wetland restoration into the design, the site can enhance rainwater retention and natural filtration functions. Rainwater can not only help improve the urban ecological environment but can also be reused as a

resource. Through design, rainwater collection systems can be implemented to provide water for irrigation, cleaning, or landscape watering.[12]

Many industrial sites are located near water bodies or rivers, and waterway restoration is a key component of landscape-first transformation. Reviving and restoring buried waterways to natural waterflow paths can increase water mobility and restore the ecological environment of water bodies. This process not only improves water quality but also enhances the surrounding landscape value. Hard protective embankments can be opened and transformed into graded slopes and terraces, creating soft, flood-prone shorelines. Integrating original water sources with the surrounding natural environment brings water closer to the people, transforming it into a decorative element in the industrial heritage transformation.

- Age-Friendly Design:

In the design process of transforming industrial land into public spaces, age-friendly design ensures that the space meets the functional, accessibility, safety, and comfort needs of all age groups, from infants, children, adolescents, and adults to the elderly, ensuring that everyone can enjoy the benefits and services of the space. Age-friendly design not only enhances social inclusion but also increases the space's usability and engagement among people.[14]

When designing pathways, connectivity from transportation hubs, surrounding communities, and internal areas should be carefully considered. Pathways should be designed to connect all age groups, allowing easy access without environmental constraints. Special attention should be given to the safety needs of the elderly, who may experience vision, hearing, and mobility issues. For the elderly and children, falls are a common risk. Non-slip materials should be used, particularly in areas like walkways, stairs, and platforms, which are susceptible to moisture. The surface material should also provide high friction to reduce the risk of slipping. For staircases, consistent step height should be ensured, with clear edge markings.

Since the elderly, pregnant women, and children are prone to fatigue, ample seating should be provided along pathways, greenways, and parks for resting.

For children, special attention should be given to creating child-friendly spaces. When designing play areas, the psychological and physiological characteristics of children should be considered. Play equipment such as slides, swings, sandpits, and climbing structures should be provided, ensuring that they are free from sharp edges or hard corners to avoid injury. Additionally, designs should ensure that parents can clearly see their children's play areas for safety. For the elderly, quiet environments are preferred. The design should incorporate peaceful green spaces or benches near lakes to allow for relaxation, meditation, or socializing with friends. Multi-functional social spaces, such as plazas and sunny lawns, should also be designed to accommodate social activities of different age groups, such as festivals, art performances, markets, and fairs.[15]

The core of age-friendly design is inclusivity and accessibility. The space design should address the specific needs of each age group, ensuring that everyone, from children's play areas to elderly rest zones, finds a suitable place within the public space. This not only enhances community cohesion but also revitalizes and diversifies urban public spaces.

- Low-Carbon and Sustainable Design:

The adoption of low-carbon and sustainable design methods will have a profound impact on the transformation of industrial land. This approach not only focuses on reducing environmental impact and carbon emissions but also requires comprehensive consideration of architecture, material selection, energy use, and ecological restoration to ensure long-term sustainability and environmental friendliness.[16]

Recyclable and reusable materials should be selected, such as recycled steel, recycled concrete, and reclaimed wood, which consume less energy in the production process and reduce waste generation. Recycled materials can

significantly reduce the carbon footprint of building materials. Locally produced building materials should be prioritized to reduce carbon emissions from transportation. Using local natural materials, such as stone, wood, and soil, not only reduces energy consumption but also strengthens the connection between the building and its surrounding environment.[18]

Rainwater collection systems should be implemented in outdoor areas to collect and store rainwater for non-potable uses such as park irrigation, sanitation, and cooling systems. This not only reduces pressure on municipal water supplies but also improves the efficiency of water resource utilization. Design features like rain gardens and retention ponds can help rainwater seep into the ground, reducing runoff and preventing flooding.

Ecological restoration of industrial sites should be carried out to restore their natural environmental functions. Techniques such as soil pollution remediation, water body restoration, and vegetation reconstruction should be used to revitalize polluted land. Planting adaptive, low-water native species will reduce pressure from invasive species on the local ecosystem and enhance biodiversity. Vegetation planting not only beautifies the environment but also mitigates the urban heat island effect. Integrating buildings with the natural environment and connecting them to surrounding parks and landscapes will provide habitats for wildlife and enhance the ecosystem services of the region.

2.2. Universal design requirements in the spatial organization of public spaces

In public space design, spatial organization refers to the rational layout and coordination of different functional zones, ensuring accessibility, safety, comfort, and sustainability. Universal design requirements ensure that all people, regardless of age, ability, or background, can equally use and enjoy these spaces. Below are the universal design requirements for the spatial organization of public spaces, covering design principles, spatial layout, safety, comfort, and other aspects.

Design should prioritize pedestrian connectivity. Public spaces should provide clear walking paths to ensure good connectivity between different functional zones. When designing, it is necessary to consider reasonable walking paths, avoiding overly long detours or dead ends, and ensuring smooth pedestrian flow.

Additionally, the design should ensure open sightlines within the space, avoiding blind spots. Whether for public activity areas or recreational zones, visibility should be considered so that users can clearly see their surroundings, increasing the sense of safety. Special attention should be given to areas with low lighting or at night, where design should avoid obscured or blocked areas. Non-slip design should be incorporated by using anti-slip materials on floors, stairs, and ramps, especially in wet conditions such as rainy days or heavy morning dew, ensuring that the ground remains dry and provides good traction.

In spatial organization, different functional zones should be clearly defined. There should be a rational spatial layout to avoid functional overlap and conflict. The size of each functional zone should be adjusted according to its frequency of use and needs. Transitional spaces, such as corridors, rest areas, or plazas, should be designed between different functional zones to soften the boundaries between them, providing spaces for gathering, resting, and transition.

Public spaces should offer comfortable seating areas, particularly designed for groups such as the elderly, pregnant women, and children. Public spaces should also consider climate and seasonal variations, providing appropriate shading and rain protection, especially in outdoor activity areas. Proper landscaping can enhance the comfort of the space and contribute to biodiversity. Plants not only beautify the environment but also provide shading and cooling. In open public spaces, reasonable placement of trees, shrubs, and flowers can improve the overall environmental experience for users.

In public space design, the use of appropriate colors and materials can enhance the visual appeal of the space. Color coordination should be harmonious, though contrasting colors can be used to highlight specific areas or functions, making the

space more dynamic and layered. The space should have an artistic and cultural atmosphere, with elements such as art installations and sculptures to enhance its visual appeal and cultural value. At the same time, the artworks and installations should consider the interests and cultural backgrounds of the public, ensuring they are suitable for diverse groups.

In terms of spatial organization, diverse activity spaces should be provided for people of different cultures, ages, genders, and backgrounds. For example, the layout of children's play areas, adult recreational zones, and elderly activity spaces should ensure that the needs of each group are met. Measures should also be taken to reduce noise impact on the public. This can be achieved through the design of green buffers, soundproof walls, and the use of sound-absorbing materials to control noise propagation, providing quiet areas for relaxation.

2.3. Basic methods of forming public space design

This study analyzes several design cases of industrial heritage transformation into public spaces, evaluating each project across five key dimensions: adaptive reuse, industrial archaeology and narrative display, landscape-first transformation, age-friendly design, and low-carbon and sustainable design. The focus is on the methods adopted for transforming industrial heritage into public spaces. The analysis of these cases provides empirical evidence of how theoretical concepts are applied to real-world scenarios, demonstrating the effectiveness of these design strategies in the transformation of industrial heritage into public spaces, and offering valuable insights for the final design proposal.

● Xiahe Park (Fig. A.2.3.1)

The Xiahe Park renovation project in Hangzhou is a typical example of industrial heritage reuse. Located along the Grand Canal, the site was originally the first oil depot built in Zhejiang province after the founding of the People's Republic of China. The project, designed by Kengo Kuma & Associates, aims to transform the abandoned industrial land into a multifunctional open park while preserving

industrial remnants and integrating them into modern urban life. The following evaluation covers five key dimensions:

1. Adaptive Reuse

The project preserves four historical warehouses and seven oil tanks, transforming them into theaters, event spaces, shops, and vertical connections. The preservation of the warehouse structures combines weathered steel with exposed concrete and red brick, maintaining the site's unique industrial character. This approach not only preserves historical memories but also injects new life into the space with modern functions.

2. Industrial Archaeology and Narrative Display

By retaining and repurposing industrial remnants such as oil tanks and warehouses, the project creates a space for displaying "industrial memory." These remnants are cleverly integrated into the park design, serving as platforms for cultural and historical heritage. The design language and materials used narrate the transition from industry to culture to public space, enhancing the site's narrative and cultural depth.

3. Landscape-First Transformation

The design emphasizes the primacy of landscape, utilizing a netted ETFE roof to connect buildings and create diverse landscape spaces. The custom spot-patterned roof, resembling leaves, filters sunlight and provides soft, semi-transparent shading. This design not only enhances the comfort of the space but also strengthens its integration with the natural environment.

4. Age-Friendly Design

The design addresses the needs of various age groups by providing multifunctional spaces, including children's play areas and elderly rest zones. Additionally, the park's pathways and facilities are designed to be fully accessible, embodying the concept of age-friendly design.

5. Low-Carbon and Sustainable Design

The project incorporates various sustainable design strategies, such as using weathered steel and ETFE materials to minimize environmental impact, and implementing a rainwater collection system and green vegetation to improve ecological quality. The project also focuses on energy conservation and resource recycling, reflecting a low-carbon and sustainable design philosophy.

● Jining Zoucheng Ferroalloy 1971 Industrial Heritage Park (Fig. A.2.3.2)

The Jining Zoucheng Ferroalloy 1971 Industrial Heritage Park renovation project is a typical industrial heritage reuse example in Shandong province, located on the site of the Lunan Ferroalloy Plant. The project aims to transform the abandoned industrial facilities into modern urban public spaces. Designed by Shanghai Hop Architecture & Design Studio, the project emphasizes cultural heritage, ecological restoration, and the integration of public leisure functions. The following evaluation covers five key dimensions:

1. Adaptive Reuse

The project adheres to the "minimal intervention principle," preserving key industrial equipment such as blast furnaces, hot blast stoves, and bag filters as core exhibition elements. These remnants are restored and artistically treated, retaining their industrial characteristics. A new aerial walkway runs through the park, connecting various key production equipment and creating an immersive spatial experience, allowing citizens to engage closely with industrial culture and the spirit of the site.

2. Industrial Archaeology and Narrative Display

By preserving and restoring industrial remnants such as blast furnaces and hot blast stoves, the project creates an "industrial memory" display space. These remnants are cleverly integrated into the park design, serving as platforms for cultural and historical heritage. The design language and materials used narrate the transition

from industry to culture to public space, enhancing the site's narrative and cultural depth.

3. Landscape-First Transformation

The design emphasizes landscape as a priority, employing restrained design techniques that highlight the strict integrity and order of the industrial style. By retaining native vegetation and using simple, structured forms, the landscape harmonizes with the natural environment. This design not only enhances the comfort of the space but also fosters integration with nature.

4. Age-Friendly Design

The design takes into account the needs of different age groups by providing multifunctional spaces such as leisure areas and observation platforms. The park's pathways and facilities meet accessibility standards, ensuring use by people of all ages and abilities, embodying the principles of age-friendly design.

5. Low-Carbon and Sustainable Design

The project incorporates various sustainable design strategies, such as using weathered steel and ETFE materials to reduce environmental impact, and implementing a rainwater collection system and green vegetation to improve ecological quality. The project also focuses on energy conservation and resource recycling, reflecting a low-carbon and sustainable design philosophy.

● **Zhangjiakou Industrial Culture Theme Park (Fig. A.2.3.3)**

The Zhangjiakou Industrial Culture Theme Park (Phase I) is located in the Qiaoxi District of Zhangjiakou City, Hebei Province, covering an area of 168 acres, with a total investment of approximately 600 million RMB. The project, designed by Beijing Yijingyuan Landscape Planning and Design Company, aims to transform abandoned industrial land into a city public space with cultural value and ecological function. The following evaluation covers five key dimensions:

1. Adaptive Reuse

The project fully utilizes the existing industrial remnants, such as abandoned factory buildings and equipment, for restoration and reuse. The buildings are preserved while being functionally transformed to meet the needs of modern urban parks. This approach preserves historical memories while breathing new life into the space.

2. Industrial Archaeology and Narrative Display

By preserving and displaying industrial relics, the project creates a space for "industrial memory." These remnants are cleverly integrated into the park design, serving as cultural and historical heritage platforms. The design language and materials used narrate the transition from industry to culture to public space, enriching the narrative and cultural depth of the site.

3. Landscape-First Transformation

The design focuses on landscape priorities, employing modern landscape design techniques that emphasize the openness and flow of the space. Greenery, landscape features, and water elements are introduced to create a harmonious integration with the natural environment. This design not only enhances the comfort of the space but also strengthens the connection to nature.

4. Age-Friendly Design

The design considers the needs of various age groups by providing multifunctional activity spaces, such as children's play areas and elderly leisure zones. The park's pathways and facilities meet accessibility standards, ensuring use by people of all ages and abilities, reflecting an age-friendly design philosophy.

5. Low-Carbon and Sustainable Design

The project adopts various sustainable design strategies, such as using environmentally friendly materials and energy-efficient facilities to reduce its

environmental impact. The introduction of a rainwater collection system and green vegetation improves the ecological quality of the environment. Additionally, the project emphasizes energy conservation and resource recycling, demonstrating a commitment to low-carbon and sustainable design principles.

● **Parco Dora Industrial Site Redevelopment Park in Italy (Fig. A.2.3.4)**

The Parco Dora Industrial Site Redevelopment Park in Turin, Italy, designed by Latz + Partner, is a typical post-industrial landscape regeneration project located along the Dora River, covering an area of about 45 hectares. The project began in 2004, was incorporated into Italy's 150th anniversary celebration in 2007, and was completed in 2012, receiving numerous awards, including the 2012 International Architecture Award and the 2017 European Horticultural Award. The following evaluation covers five key dimensions:

1. Adaptive Reuse

Parco Dora successfully preserves key industrial remnants, such as the blast furnace tower, cooling tower, and steel column structures from the Vitali steel plant. These remnants were restored and transformed into multifunctional spaces, such as event areas, walkways, and observation platforms, forming an "industrial relic garden." Through minimal intervention, the project preserves industrial elements while giving them new public functions, achieving a blend of history and modernity.

2. Industrial Archaeology and Narrative Display

The project preserves and displays industrial heritage, such as the steel columns and cooling towers from the Vitali plant, creating a space for "industrial memory." These remnants are cleverly integrated into the park design, serving as platforms for cultural and historical heritage. The design language and materials used narrate the transformation from industry to culture to public space, deepening the site's narrative and cultural layers.

3. Landscape-First Transformation

The design prioritizes landscape, utilizing modern landscape design techniques to emphasize the openness and flow of space. Greenery, landscape features, and water elements are incorporated to create a harmonious integration with the natural environment. This design not only enhances the comfort of the space but also strengthens its connection to nature.

4. Age-Friendly Design

The design addresses the needs of different age groups by providing multifunctional spaces such as children's play areas and elderly leisure zones. The park's pathways and facilities are designed to meet accessibility standards, ensuring inclusivity for people of all ages and abilities, embodying the age-friendly design concept.

5. Low-Carbon and Sustainable Design

The project incorporates various sustainable design strategies, such as the use of environmentally friendly materials and energy-efficient facilities to reduce environmental impact. The introduction of a rainwater collection system and green vegetation enhances the ecological quality of the site. Additionally, the project emphasizes energy conservation and resource recycling, reflecting a commitment to low-carbon and sustainable design principles.

Conclusions to the second chapter

1. In the transformation of industrial heritage sites into public spaces, the design strategy emphasizes the integration of historical preservation with modern functionality, focusing on the sustainability of the space, ecological restoration, and social inclusivity. The following is a summary of the design dimensions:
 - **Adaptive Reuse:** Adaptive reuse is one of the core methods for transforming industrial heritage sites. The design emphasizes retaining the original structure

and historical characteristics of the building while introducing new functions. Through a minimal intervention approach, the design prioritizes repairing rather than demolishing, and adding rather than replacing, ensuring the preservation of the building's historical and cultural value. At the same time, new structures and materials must match the original building to ensure stability and suitability.

- **Industrial Archaeology and Narrative Display:** The transformation of industrial heritage sites is not only about the physical reuse of space but also the regeneration of history and culture. Through the study of historical backgrounds, production processes, and key historical milestones, the design converts these elements into a narrative path for the site. By preserving key industrial remnants such as factory buildings, silos, and chimneys, these elements serve as carriers of historical stories, allowing visitors to experience the industrial cultural journey within the space.
- **Landscape-First Transformation:** Landscape design not only addresses the environmental issues of the industrial heritage site but also makes the space more multifunctional and ecologically friendly. Through the restoration of polluted soils, the recovery of water bodies, and the design of rainwater management systems, the site achieves the restoration and enhancement of ecological functions. In addition, through the design of greenery, permeable paving, and water features, the space's comfort and natural feel are enhanced, strengthening its integration with the surrounding environment.
- **Age-Friendly Design:** Age-friendly design ensures that the space meets the needs of various age groups, particularly the elderly, children, and those with limited mobility. The design includes accessible facilities, comfortable resting areas, and activity zones suitable for different age groups, ensuring that everyone can enjoy the convenience and comfort offered by the space.

- **Low-Carbon and Sustainable Design:** Low-carbon and sustainable design is a key guiding principle for the transformation of industrial heritage sites. By selecting environmentally friendly materials, energy-efficient facilities, green vegetation, and rainwater collection systems, the design reduces environmental impact, improves ecological quality, and ensures the long-term sustainability of the project. Ecological restoration and resource recycling are also prioritized in the design.
2. The transformation of industrial heritage sites is not only a reshaping of space functions but also a protection and continuation of historical and cultural values. Through adaptive reuse, industrial archaeology, landscape transformation, age-friendly design, and sustainable development strategies, the project achieves a harmonious coexistence of history, culture, and modern functionality, serving as a model for urban public space transformation and ecological restoration.

CHAPTER III. DEVELOPMENT OF AN EXHIBITION SPACE PROJECT BASED ON THE PRINCIPLES OF SPATIAL NARRATIVE THEORY

Based on the results of the literature review, case analysis, and field observations, this design focuses on the transformation of industrial heritage into public spaces using spatial narrative theory. The aim is to explore how spatial design can be utilized to convert industrial heritage sites into public spaces, with a particular emphasis on the application of spatial narrative theory in creating exhibition spaces. The design outlines key principles and considerations, including adaptive reuse, industrial archaeology and narrative display, landscape-first transformation, age-friendly design, and low-carbon and sustainable design, ensuring that the final design is both practical and effective while achieving the ultimate goal of transforming industrial heritage into public spaces.

CONCEPT

The transformation of industrial heritage into public spaces based on spatial narrative theory aims to explore how spatial design can convert industrial sites into public spaces, with a particular focus on using spatial narrative theory to construct exhibition spaces. The design should address the following key aspects:

1. Adaptive Reuse

In the early stages of design, a systematic value assessment of the existing buildings should be conducted to identify which parts of the structure possess historical, cultural, technical, or architectural value. This evaluation ensures the preservation of the most representative elements and details. The "minimal intervention" principle should be applied, with moderate restoration and reinforcement to retain the original structure and materials (such as steel and concrete) without extensive demolition. New structures and materials should use lightweight materials to minimize the impact on the original building. When redesigning existing industrial facilities, the new functions must be compatible with the old building, avoiding large-scale alterations to the original spatial layout.

2. Industrial Archaeology and Narrative Display

Industrial archaeology and narrative display focus on using space to tell the history of the site, helping visitors understand the past and evolution of the industrial heritage. Comprehensive historical research is required to understand the background, historical development, and production processes of the industrial site. This information should be transformed into a narrative framework for the exhibition space. Representative industrial facilities should be preserved as central elements of the display. These remnants will demonstrate the production processes, technological innovations, and social changes. Modern technologies should be incorporated into the design to allow visitors to more intuitively engage with the "recreation" of history. Additionally, the design must ensure "readability," meaning that new and old materials, structures, and spatial forms should be clearly

distinguishable. Thoughtful spatial organization and detailed design should enable visitors to naturally "read" the history within the space.

3. Landscape-First Transformation

Landscape design is a critical component of industrial heritage transformation, enhancing environmental quality and increasing the space's appeal. The design should prioritize addressing historical pollution issues on the site, using appropriate remediation measures to restore the ecological functions. The design should also consider restoring natural waterways and managing rainwater, such as through permeable paving, rain gardens, and other techniques to reduce runoff and facilitate the recycling and reuse of rainwater. Furthermore, the design should incorporate vegetation restoration and planting native species to enhance biodiversity and improve air quality. Adding green spaces and landscape features will make the space more pleasant, enhancing comfort and ecological functions.

4. Age-Friendly Design

Age-friendly design ensures that the space is accessible and safe for all age groups. Pathways, plazas, and other public areas should be designed for accessibility, especially for the elderly and children, with wide passages connecting each landscape node. The design should prioritize safety and comfort, particularly for elderly and child users, by incorporating non-slip surfaces, spacious resting areas, and reasonable seating arrangements to reduce fall risks and provide ample resting space. The design should include leisure areas and social spaces (such as plazas and open lawns) to accommodate different age groups. Particularly, designing multifunctional social spaces, such as areas for festivals, markets, and art performances, can promote interaction between diverse groups.

5. Low-Carbon and Sustainable Design

Low-carbon and sustainable design focuses on reducing environmental impact and enhancing the long-term sustainability of the space. Recyclable, low-energy

building materials should be chosen, such as recycled concrete, reclaimed steel, and reclaimed wood, to reduce the carbon footprint during construction. Ecological restoration and green infrastructure should also be incorporated into the design. Methods such as vegetation reconstruction, rainwater collection systems, and green roofs not only improve the ecological environment of the space but also mitigate the urban heat island effect and enhance biodiversity.

GENERAL CONCLUSIONS

This study explores the design methods and strategies for transforming industrial heritage into public spaces.

1. Through the analysis of multiple domestic and international case studies, an integrated framework based on key design dimensions such as adaptive reuse, industrial archaeology and narrative display, landscape-first transformation, age-friendly design, and low-carbon and sustainable design is proposed. The findings suggest that the transformation of industrial heritage requires not only attention to the preservation of history and culture but also consideration of modern functional needs, ensuring that the space aligns with the demands of societal development.
2. **Adaptive Reuse:** The reuse of industrial heritage is the core element in the transformation process. Through the principle of minimal intervention, the original structure and historical characteristics of the building are preserved while introducing new functions. The design ensures that new and old structures are integrated, preserving the historical feel while enhancing the space's functionality.
3. **Industrial Archaeology and Narrative Display:** By conducting in-depth historical research, the design transforms the cultural and technological value of industrial heritage into a walkable, experiential narrative path. This narrative display enhances the cultural depth of the space, allowing visitors to better understand the historical and social significance behind the heritage site.

4. Landscape-First Transformation: Landscape design not only addresses pollution issues but also restores the ecological functions of the environment. Through waterway restoration, rainwater management, and vegetation restoration, the design improves environmental quality while ensuring the comfort and appeal of the space.

5. Age-Friendly Design: Age-friendly design ensures that users of all ages can enjoy the convenience and safety of the space. By incorporating well-designed pathways, accessible facilities, and comfortable resting areas, the design provides safe and convenient conditions for elderly people, children, and those with limited mobility.

6. Low-Carbon and Sustainable Design: Low-carbon and sustainable design is a key consideration in the transformation process. By adopting renewable materials, energy-saving technologies, green vegetation, and rainwater collection systems, the design effectively reduces carbon emissions and enhances the long-term sustainability of the space.

By combining these design methods and strategies, industrial heritage can be effectively preserved and reused, transforming into public spaces with modern functions. This transformation not only preserves historical memory but also meets the needs of modern society. Ultimately, it creates spaces that contribute to urban cultural value, ecological functionality, and promotes social inclusivity and sustainable development.

REFERENCES

1. 胡子瑾. 场所记忆下的船舶工业遗址公园规划设计研究[D]. 山东建筑大学, 2024.
2. 苗明瑞, 吴尧, 冯律航, 龙婉月. 工业废弃地活化更新理论实践研究综述[J]. 建筑与文化, 2024, (09): 205-209.
3. Bullen, P. A., & Love, P. E. D. (2011). Adaptive reuse of heritage buildings. *Structural Survey*, 29(5), 411–421.
4. Douglas, J. (2006). *Building Adaptation* (2nd ed.). Oxford: Butterworth-Heinemann / Routledge.
5. Elsorady, D. A. (2014). Assessment of the compatibility of new uses for heritage buildings: The example of Alexandria National Museum. *Journal of Cultural Heritage*, 15(4), 511–521.
6. Foster, G., & Saleh, R. (2021). The adaptive reuse of cultural heritage in European circular city plans: A systematic review. *Sustainability*, 13(5), 2889.
7. Palmer, M., & Neaverson, P. (1998). *Industrial Archaeology: Principles and Practice*. London/New York: Routledge.
8. Tzortzi, K. (2015). *Museum Space: Where Architecture Meets Museology*. London/New York: Routledge.
9. Kirchberg, V., & Tröndle, M. (2012). Experiencing exhibitions: A review of studies on visitor experiences in museums. *Curator: The Museum Journal*, 55(4), 435–452.
10. Fletcher, T. D., Shuster, W., Hunt, W. F., Ashley, R., Butler, D., Arthur, S., ... Mikkelsen, P. S. (2015). SUDS, LID, BMPs, WSUD and more – The evolution and application of terminology. *Urban Water Journal*, 12(7), 525–542.

11. Ahiablame, L. M., Engel, B. A., & Chaubey, I. (2012). Effectiveness of low impact development practices: Literature review and suggestions for future research. *Water, Air, & Soil Pollution*, 223, 4253–4273.
12. De Sousa, C. A. (2003). Turning brownfields into green space in the City of Toronto. *Urban Forestry & Urban Greening*, 2(4), 181–190.
13. Tzoulas, K., Korpela, K., Venn, S., Yli-Pelkonen, V., Kazmierczak, A., Niemela, J., & James, P. (2007). Promoting ecosystem and human health in urban areas using Green Infrastructure. *Landscape and Urban Planning*, 81(3), 167–178.
14. World Health Organization. (2007). *Global Age-friendly Cities: A Guide*. Geneva: WHO.
15. The Center for Universal Design. (1997). *The Principles of Universal Design*. Raleigh, NC: North Carolina State University.
16. Pomponi, F., & Moncaster, A. (2016). Embodied carbon mitigation and reduction in the built environment – What does the evidence say? *Renewable and Sustainable Energy Reviews*, 43, 143–166.
17. Pomponi, F., & Moncaster, A. (2017). Circular economy for the built environment: A research framework. *Journal of Cleaner Production*, 143, 710–718.
18. Royal Institution of Chartered Surveyors (RICS). (2017). *Whole Life Carbon Assessment for the Built Environment* (1st ed.). London: RICS.
19. Loures, L., & Panagopoulos, T. (2007). Sustainable reclamation of industrial areas in urban landscapes. *WSEAS Transactions on Environment and Development*, 3(10), 181–188.
20. Harnik, P., & Welle, B. (2009). *Measuring the Economic Value of a City Park System*. The Trust for Public Land.
21. TICCIH. (2003). *The Nizhny Tagil Charter for the Industrial Heritage*. The International Committee for the Conservation of the Industrial Heritage.

22. Langston, C., Wong, F. K. W., Hui, E. C. M., & Shen, L. Y. (2008). Strategic assessment of building adaptive reuse opportunities in Hong Kong. *Building and Environment*, 43(10), 1709–1718.
23. Plevoets, B., & Van Cleempoel, K. (2011). Adaptive reuse as an emerging discipline: An historic survey. *Facilities*, 29(3/4), 208–217.
24. Yung, E. H. K., & Chan, E. H. W. (2012). Critical social sustainability factors in urban conservation: The case of the Central Police Station compound in Hong Kong. *Habitat International*, 36(3), 352–362.
25. Conejos, S., Langston, C., & Smith, J. (2014). AdaptSTAR model: A climate-friendly strategy to promote built environment sustainability. *Habitat International*, 41, 85–92.
26. Bie Plevoets & Koenraad Van Cleempoel. (2019). *Adaptive Reuse of the Built Heritage: Concepts and Cases of an Emerging Discipline*. Routledge.
27. Palmer, M., & Neaverson, P. (2001). *Industrial Archaeology: Principles and Practice*. Routledge.
28. Douet, J. (Ed.). (2012). *Industrial Heritage Re-tooled: The TICCIH Guide to Industrial Heritage Conservation*. Routledge/TICCIH.
29. Storm, A. (2014). Post-industrial landscape scars: Formation, representation, and reuse of abandoned mines. *Ambio*, 43(2), 249–260.
30. MacLeod, S., Hanks, L., & Hale, J. (Eds.). (2012). *Museum Making: Narratives, Architectures, Exhibitions*. Routledge.
31. Wineman, J., & Peponis, J. (2010). Constructing spatial meaning: Spatial affordances in museum design. *Environment and Behavior*, 42(1), 86–109.
32. Bitgood, S. (2010). The attention-value model of museum visitors. *Visitor Studies*, 13(2), 146–165.

33. Dixon, T., Raco, M., Catney, P., & Lerner, D. N. (2007). Sustainable brownfield regeneration: CABERNET Network. *Journal of Environmental Planning and Management*, 50(5), 579–600.
34. Loures, L., & Vaz, E. (2016). Exploring expert perception towards brownfield redevelopment benefits according to their typology. *Habitat International*, 57, 1–9.
35. Kim, H., & Miller, P. A. (2019). The impact of green infrastructure on heat mitigation: A review. *Sustainable Cities and Society*, 48, 101537.
36. O'Rourke, E., & Kramm, N. (2012). High nature value (HNV) farming and green infrastructure: A review. *Land Use Policy*, 29(1), 9–15.
37. Kowarik, I., & Körner, S. (Eds.). (2005). *Wild Urban Woodlands*. Springer.
38. Buffel, T., Phillipson, C., & Scharf, T. (2012). Ageing in urban environments: Developing age-friendly cities. *Critical Social Policy*, 32(4), 597–617.
39. Steinfeld, E., & Maisel, J. (2012). *Universal Design: Creating Inclusive Environments*. Wiley.
40. Finkelstein, R., et al. (2008). What makes a city age-friendly? *Journal of Urban Health*, 85(4), 626–638.
41. Giesekam, J., Barrett, J., & Taylor, P. (2014). Construction sector emissions and building decarbonisation. *Energy and Buildings*, 78, 202–214.
42. Cabeza, L. F., Rincón, L., Vilariño, V., Pérez, G., & Castell, A. (2014). Life cycle assessment (LCA) and life cycle energy analysis (LCEA) of buildings—A review. *Renewable and Sustainable Energy Reviews*, 29, 394–416.
43. Chastas, P., Theodosiou, T., Bikas, D. (2016). Embodied energy in residential buildings—Towards zero energy buildings. *Energy and Buildings*, 132, 20–35.

44. Allwood, J. M., Ashby, M. F., Gutowski, T. G., & Worrell, E. (2011). Material efficiency: A white paper. *Philosophical Transactions of the Royal Society A*, 369(1945), 1991–2010.
45. Göswein, V., et al. (2022). Circular construction strategies for heritage buildings. *Journal of Cleaner Production*, 340, 130680.
46. Bafna, S. (2003). Space syntax: A brief introduction to its logic and analytical techniques. *Environment and Behavior*, 35(1), 17–29.
47. Hillier, B., & Tzortzi, K. (2006). Space syntax: The language of museum space. In *A Companion to Museum Studies* (pp. 282–301). Blackwell.
48. Psarra, S. (2009). *Architecture and Narrative: The Formation of Space and Cultural Meaning*. Routledge.
49. Berger, A. (2006). *Drosscape: Wasting land in urban America*. Princeton Architectural Press.
50. Latz, P. (2001). Landscape Park Duisburg-Nord. *Topos*, 34, 92–99.
51. Németh, J., & Langhorst, J. (2014). Rethinking urban transformation: Temporary uses for vacant land. *Cities*, 40, 143–150.
52. Hein, C. (2016). Port cities and urban waterfronts. *Wiley Interdisciplinary Reviews: Energy and Environment*, 5(4), 419–438.

APPENDIX A. Visual material for the text



Figure. A.2.3.1.

<https://www.gooood.cn/hangzhou-xiaohe-park-by-kengo-kuma-and-associates.htm>



Figure. A.2.3.2.

<https://www.gooood.cn/jining-zoucheng-1971-industrial-heritage-park-by-ddon.htm>



Figure. A.2.3.3.

<https://www.gooood.cn/zhangjiakou-industrial-culture-theme-park-china-by-fla-landscape-design-co-ltd.htm>

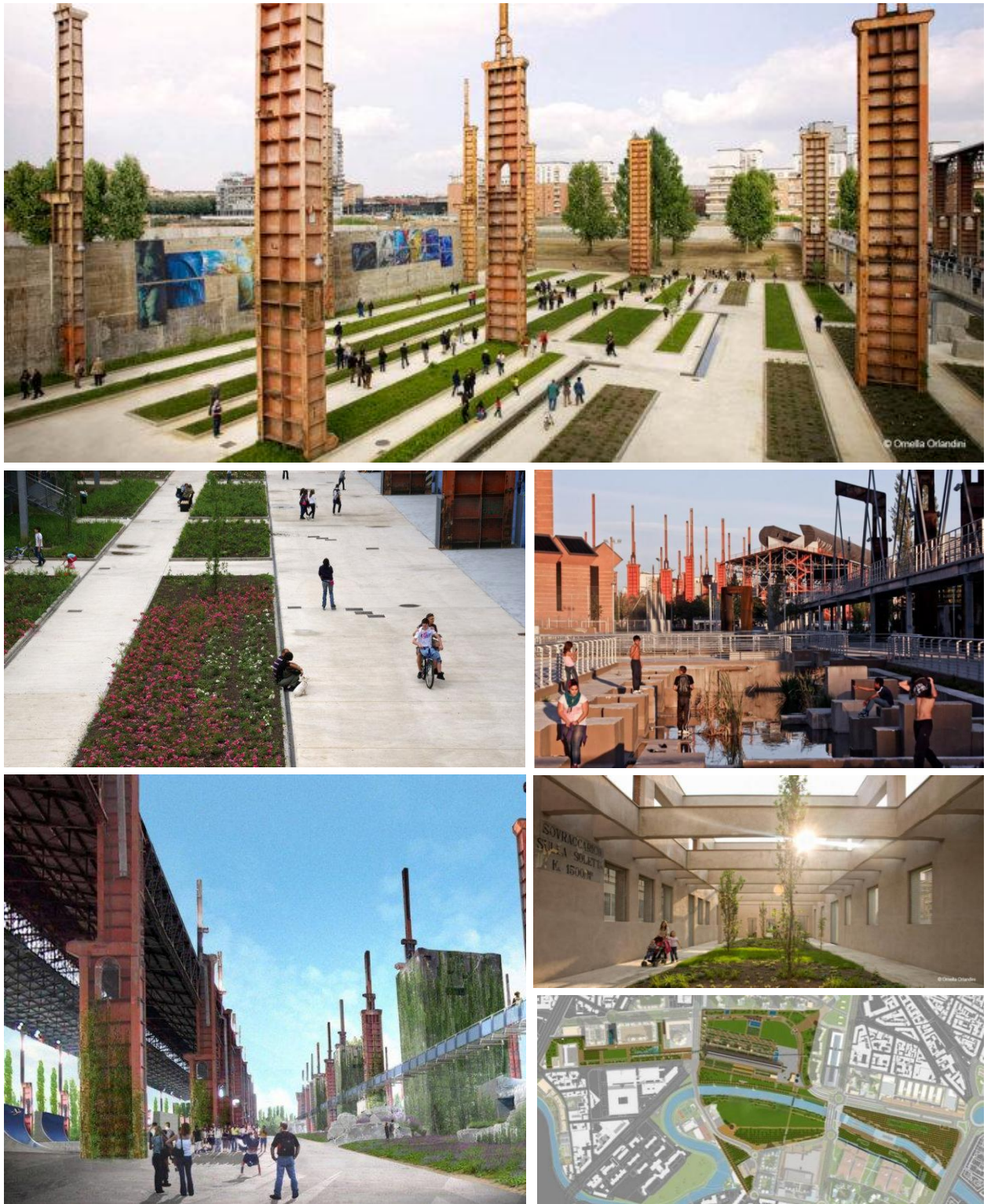


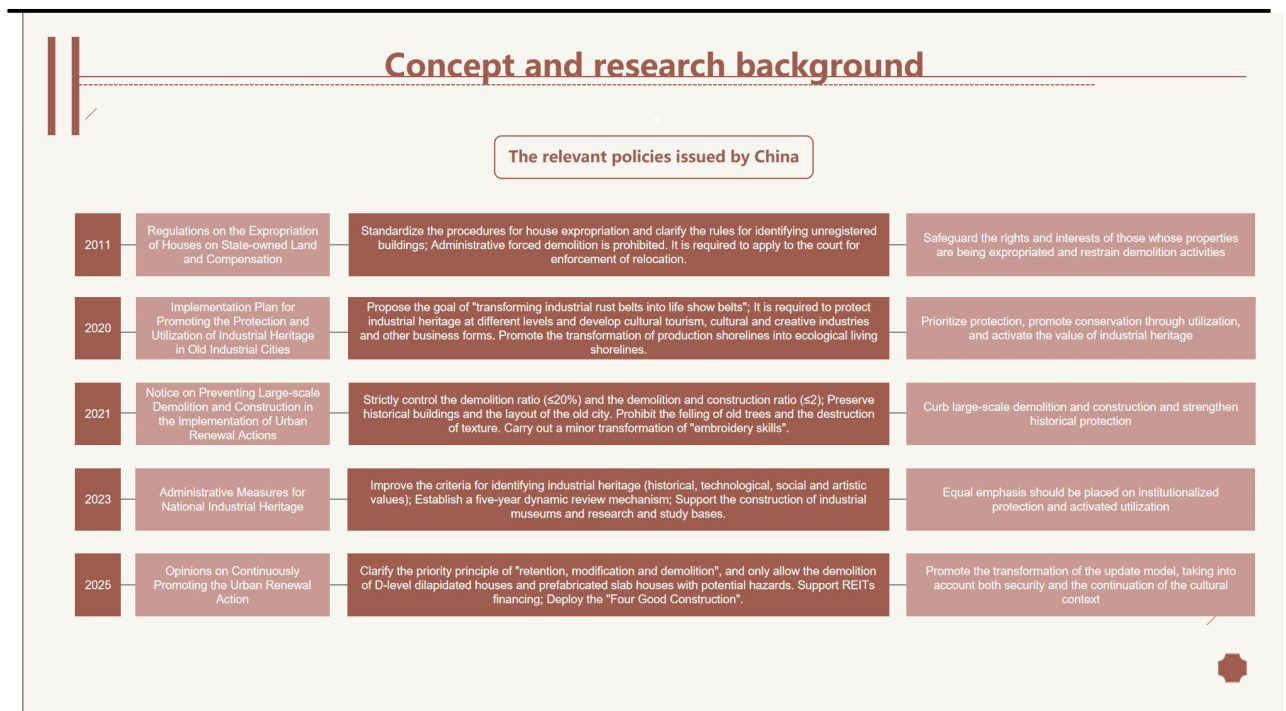
Figure. A.2.3.4.

<https://www.gooood.cn/parco-dora-turin-by-latz-partner.htm>

APPENDIX B. Tables, diagrams

Release time	Policy Name	Core content	Focus orientation
2011	Regulations on the Expropriation of Houses on State-owned Land and Compensation	Standardize the procedures for house expropriation and clarify the rules for identifying unregistered buildings; Administrative forced demolition is prohibited. It is required to apply to the court for enforcement of relocation.	Safeguard the rights and interests of those whose properties are being expropriated and restrain demolition activities
2020	Implementation Plan for Promoting the Protection and Utilization of Industrial Heritage in Old Industrial Cities	Propose the goal of "transforming industrial rust belts into life show belts"; It is required to protect industrial heritage at different levels and develop cultural tourism, cultural and creative industries and other business forms. Promote the transformation of production shorelines into ecological living shorelines.	Prioritize protection, promote conservation through utilization, and activate the value of industrial heritage
2021	Notice on Preventing Large-scale Demolition and Construction in the Implementation of Urban Renewal Actions	Strictly control the demolition ratio ($\leq 20\%$) and the demolition and construction ratio (≤ 2); Preserve historical buildings and the layout of the old city. Prohibit the felling of old trees and the destruction of texture. Carry out a minor transformation of "embroidery skills".	Curb large-scale demolition and construction and strengthen historical protection
2023	Administrative Measures for National Industrial Heritage	Improve the criteria for identifying industrial heritage (historical, technological, social and artistic values); Establish a five-year dynamic review mechanism; Support the construction of industrial	Equal emphasis should be placed on institutionalized protection and activated utilization

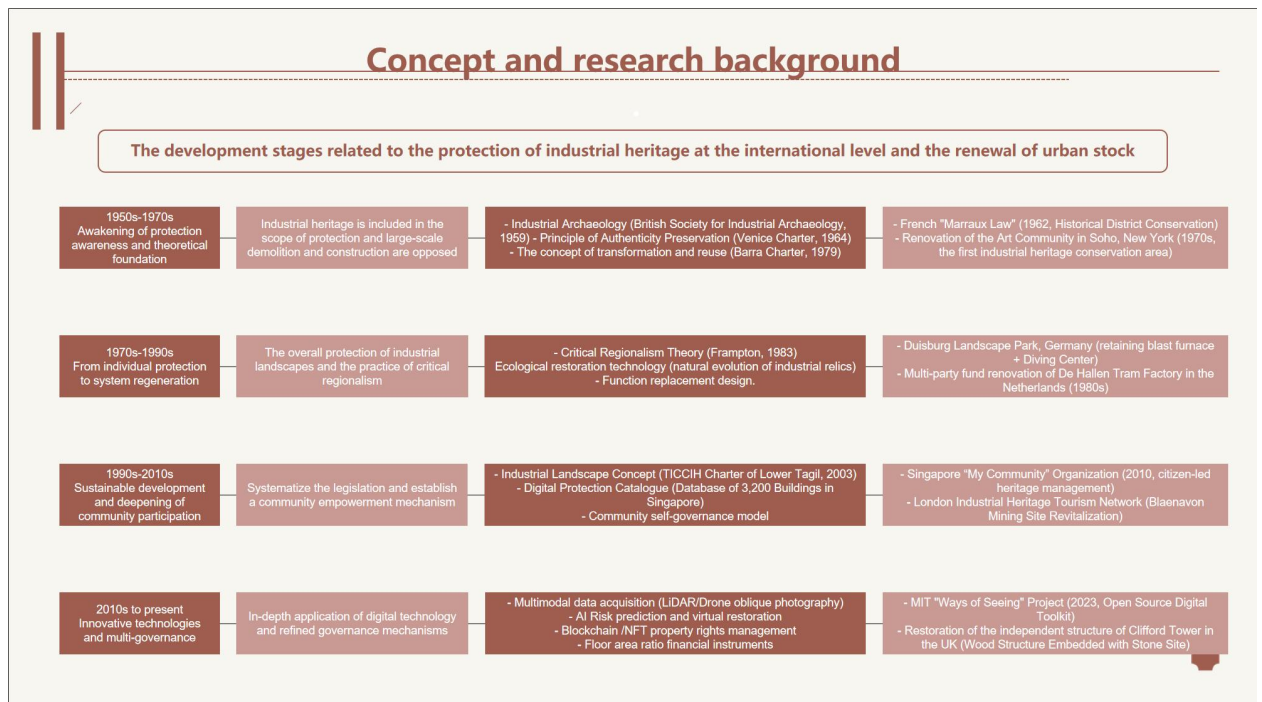
		museums and research and study bases.	
2025	Opinions on Continuously Promoting the Urban Renewal Action	Clarify the priority principle of "retention, modification and demolition", and only allow the demolition of D-level dilapidated houses and prefabricated slab houses with potential hazards. Support REITs financing; Deploy the "Four Good Construction".	Promote the transformation of the update model, taking into account both security and the continuation of the cultural context



Tabl.B.1.1.1.After the 21st century, China issued relevant policies on the demolition and preservation of old buildings, the protection of industrial heritage, and the renewal of urban stock

Time stage	Core features	Technological/theoretical innovation	Representative cases/policies
1950s-1970s Awakening of protection awareness and theoretical foundation	Industrial heritage is included in the scope of protection and large-scale demolition and construction are opposed	- Industrial Archaeology (British Society for Industrial Archaeology, 1959) - Principle of Authenticity Preservation (Venice Charter, 1964) - The concept of transformation and reuse (Barra Charter,	- French "Marraux Law" (1962, Historical District Conservation) - Renovation of the Art Community in Soho, New York (1970s, the first industrial heritage conservation area)

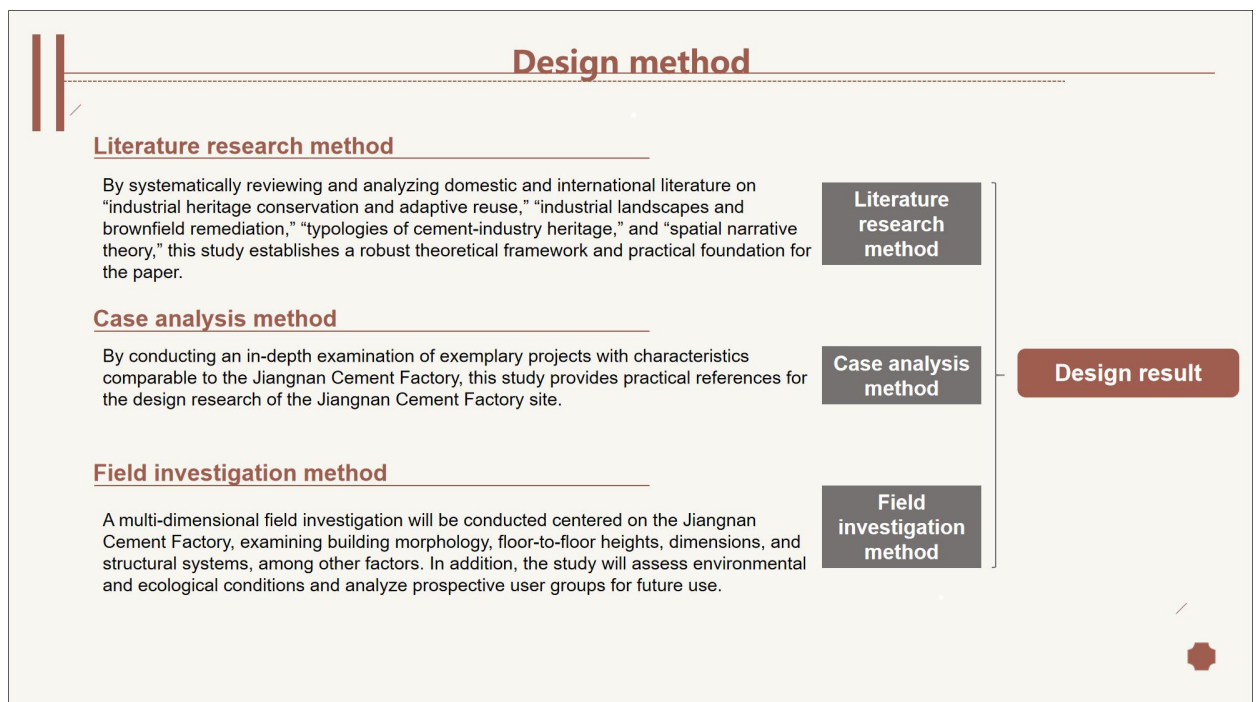
1979)			
1970s-1990s	The overall protection of industrial landscapes and the practice of critical regionalism	- Critical Regionalism Theory (Frampton, 1983) - Ecological restoration technology (natural evolution of industrial relics) - Function replacement design.	- Duisburg Landscape Park, Germany (retaining blast furnace + Diving Center) - Multi-party fund renovation of De Hallen Tram Factory in the Netherlands (1980s)
1990s-2010s	Systematize the legislation and establish a community empowerment mechanism	- Industrial Landscape Concept (TICCIH Charter of Lower Tagil, 2003) - Digital Protection Catalogue (Database of 3,200 Buildings in Singapore) - Community self-governance model	- Singapore "My Community" Organization (2010, citizen-led heritage management) - London Industrial Heritage Tourism Network (Blaenavon Mining Site Revitalization)
2010s to present	In-depth application of digital technology and refined governance mechanisms	- Multimodal data acquisition (LiDAR/Drone oblique photography) - AI Risk prediction and virtual restoration - Blockchain /NFT property rights management - Floor area ratio financial instruments	- MIT "Ways of Seeing" Project (2023, Open Source Digital Toolkit) - Restoration of the independent structure of Clifford Tower in the UK (Wood Structure Embedded with Stone Site)



Tabl.B.1.1.2.The development stages related to the protection of industrial heritage at the international level and the renewal of urban stock

Method	Research objective	Core issues/indicators	Data source/tool	Key steps	The application in this project
Literature research method	Establish the theoretical basis and evaluation framework for the transformation of industrial heritage into public Spaces	Definition and Genealogy Value dimensions (history/technology/society/landscape/low carbon) Design principles (minimum intervention, reversibility, readability, publicness, sustainability); Policies and Standards	Academic databases (Google Scholar, CNKI); Policy norms; Case report Technical Manual	Search → Screen → Compare → Summarize → form an index system	Implement the evaluation dimensions as site evaluation rulers (adaptive reuse/narrative display/landscape priority/all-age friendliness/low-carbon sustainability) for subsequent case comparisons with the site
Case analysis	Extract a combination of	Whether comparable objects have: large-	Texts, drawings,	Unified template	Map transferable

method	reusable design techniques - implementation paths - operation mechanisms; Verify the adaptability of the theory in practice	span factory buildings, rotary kilns/hot material silos, conveying trestles, chimneys, etc. Protection strategies and intervention intensity; Circulation/narrative Ecological restoration and security upgrade; Phase implementation and operation mode	photos, remote sensing/street views of similar projects at home and abroad; Interviews and media materials	filing → Horizontal comparison → Evaluation of advantages and disadvantages → Extraction of transferable key points and applicable boundaries/risk points	practices to the factory area: Determine that structures and insertable functions must be retained, organize narrative routes, and define phased implementation and operation models
Field investigation method	Obtain first-hand venue data, test and refine strategies	Current status of buildings/equipment (scale, structure, readability); Site texture and corridors; Soil/Rain flood/green volume and Heat Island Human flow behavior (arrival mode, stay, activity type); Safety and Accessibility	Measurement and mapping, photography/aerial photography, 3D scanning (if any), GIS/thermal environment rapid assessment, behavioral observation	Point mapping → Condition assessment → ecological and stormwater diagnosis → Behavior statistics → Safety/accessibility verification → Thematic mapping	Localization strategy for output: functional zoning and opening sequence, narrative path anchor points, ecological priority areas and rain and flood facility layout, barrier-free continuous walkways and safety reinforcement list



Tabl.B.1.2.1.Research methods

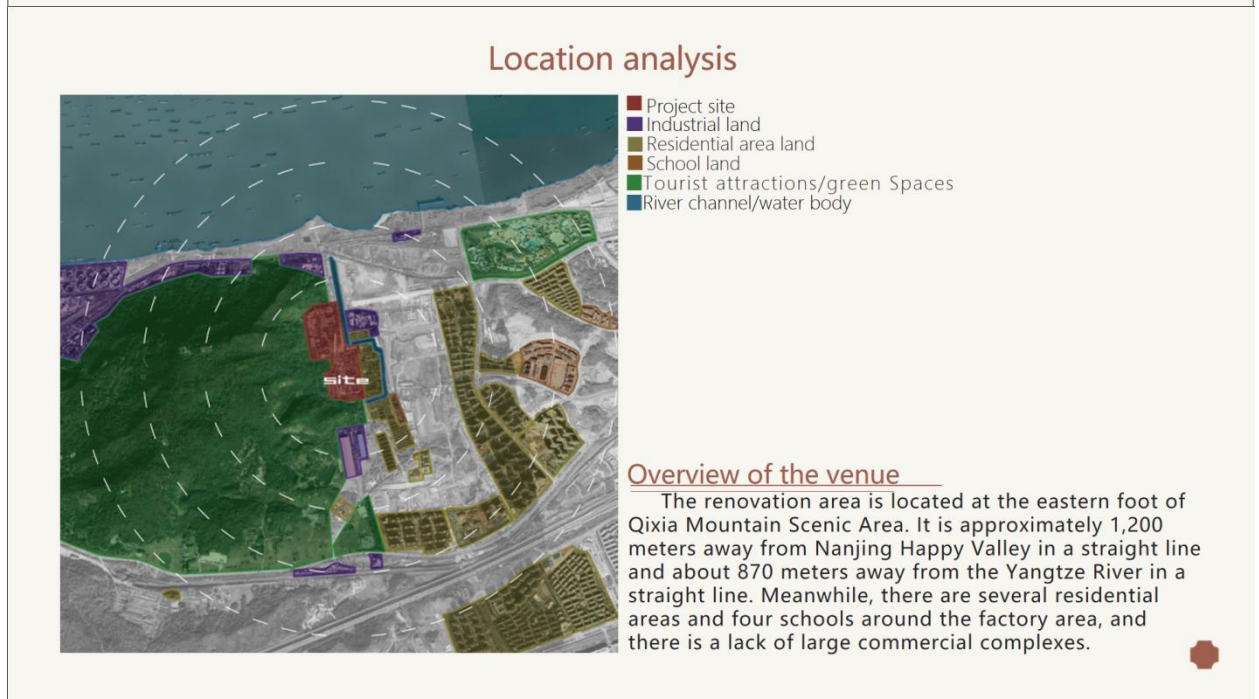
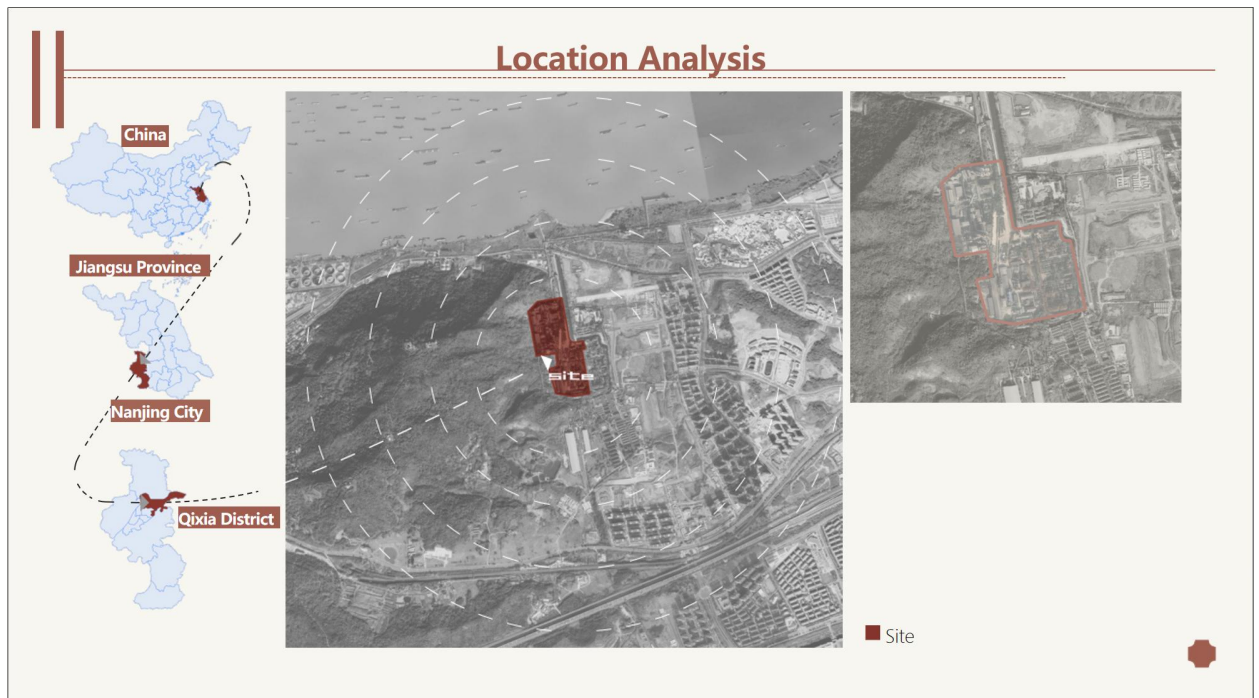
Design dimension	Objectives and Basic principles	Key strategies/approaches	Expected output/benefit
Adaptive Reuse	Minimum intervention Maintain the structure and historical features; Both new and old are readable. Performance compatibility	- Preliminary value assessment and retention list - Give priority to preserving representative structures such as factory buildings, silos, chimneys and conveyor trestles - Reversible and lightweight addition of new functions (mezzanines, walkways, connecting Bridges, viewing platforms) - New structures should be as self-contained as possible to minimize extensive welding or slotting of the original components	- Carry forward the spirit of the place and historical memory - Rapidly replace public functions and enhance the degree of integration - Reduce embodied carbon and demolition costs
Industrial Archaeology & Narrative	Translate history and the chain of craftsmanship into spatial narratives; Enhance cultural readability	- Comprehensive historical materials research (factory establishment background, production process, key nodes) - Select the remnants of "narrative anchor points" and organize walkable and experiential tour routes - Set up "visible mechanisms/tangible	- Strengthen the identity and educational functions of the venue - Enhance the visiting experience and cultural depth

		materials", clearly distinguishing between new and old	
		- Supplemented by a multimedia/tour guide system to enhance the sense of participation	
Landscape-First	Take ecological restoration as the forerunner; Build blue-green infrastructure; Enhance environmental comfort	- Pollution control (in-situ stabilization/soil replacement/phytoremediation) - Rainwater and flood management (permeable pavement, sunken green Spaces, rain gardens, wetland restoration, water storage and regulation) - Water system revival and water-friendly shorelines (softening of hard revetments into graded gentle slopes/terraces) - Local species planting and community reconstruction	- Restore ecological functions and improve water quality - Enhance microclimate and thermal comfort - Build a multi-functional open space network
Age-Friendly	Inclusiveness and accessibility Safety and comfort; Promote social integration	- Continuous accessibility pedestrian system (barrier-free connection between community, site and node) - Anti-slip floor, uniform steps, and clear edge markings - A family space with ample seating, shade, rain protection and good visibility - Quiet senior areas and multi-functional squares, lawns and other social Spaces	- Increase the utilization rate and the duration of stay - Promote intergenerational interaction and community cohesion
Low-Carbon & Sustainability	Carbon reduction throughout the entire life cycle Resource recycling Ecological resilience	- Recycled/local materials are preferred - Rainwater collection and reuse (irrigation, cleaning, landscape water) - Green roofs/three-dimensional greening, increasing greenery and cooling - Integration of architecture and	- Reduce operational and embodied carbon emissions - Improve biodiversity and the heat island effect - Enhance long-term sustainability

Methods for transforming industrial land	
Adaptive Reuse Minimize intervention by retaining structural elements and material textures. Add new functions using lightweight, reversible components (like steel walkways or platforms). Preserve the industrial character through visible original materials and selective structural reinforcement. Industrial Archaeology and Narrative Display Study the site's history, production flow, and key facilities. Create walkable, experience-driven routes that highlight historical nodes. Use authentic materials and minimal alterations to communicate the site's legacy clearly to visitors. Landscape-First Transformation Restore soil and ecology before spatial design. Use permeable surfaces, rain gardens, and wetland features to manage water. Revive buried waterways and plant native species to enhance biodiversity and public interaction with nature. Age-Friendly Design Ensure barrier-free access, safety, and comfort for all ages. Include shaded seating, child-safe play areas, quiet zones for seniors, and open plazas for communal activities, encouraging cross-generational engagement. Low-Carbon and Sustainable Design Prioritize recycled and local materials to reduce emissions. Use rainwater collection and eco-friendly drainage. Combine architecture with green infrastructure to improve thermal comfort and support long-term ecological health.	

Tabl.B.2.1.1.Methods for transforming industrial sites into public spaces

APPENDIX C. Project proposal



Current Situation Analysis



●Analysis of the Existing buildings of Jiangnan Cement Plant



There are industrial legacy buildings of relatively high height in the building complex to the north of Jiangnan Cement Plant. Although it has been in disrepair for a long time and lacks management, it still exudes the unique weighty atmosphere of heavy industry.

The water-adjacent area of the north entrance and exit is poorly managed and overgrown with weeds.



Current situation analysis

1. Lack of Overall Planning

Due to the relatively long construction period of the Jiangnan Cement Plant and its original focus on industrial production, there is a lack of an overall master plan. The buildings to the north, southwest, and southeast are not coherently connected.

2. Poor Landscape Legibility

Some areas of the Jiangnan Cement Plant have been neglected for an extended period, with a prolonged lack of on-site management. Vegetation requires pruning and systematic planning to improve the ornamental and landscape quality of the entire complex.

3. Inadequate Infrastructure Development

When the Jiangnan Cement Plant was initially built, the objective was industrial production, so ancillary infrastructure was insufficient.

Because the construction dates back quite some time, the site is now out of step with contemporary needs and lacks the infrastructure required today.

4. Unmanaged Site and Insufficient Safety

The Jiangnan Cement Plant has long been neglected, with insufficient staffing and management over an extended period, resulting in unchecked growth of grass and trees. The absence of necessary safety measures along the riverside areas may compromise personnel safety.



Стара будівля Цзяннаньського цементного заводу

Current Situation Analysis



•Floor plan of Jiangnan Cement Plant 1:250



