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INDUSTRIAL MEMORY OF A HERITAGE CORRIDOR: PROTECTION AND SPATIAL NARRATIVE OF INDUSTRIAL HERITAGE LANDSCAPES IN THE HEXI CORRIDOR

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Abstract

This study aims to break through the limitations of the individual-based paradigm in industrial heritage protection, construct a theoretical framework for the industrial heritage corridor in the Hexi Corridor, and reveal its inherent value as a dynamic historical stratum. By integrating the spatial systematicity of heritage corridors with the temporal depth of layered landscapes, it proposes the "Dual-Core Driven, Four-Step Progressive, Three-Axis Supported" model, innovatively integrating the three dimensions of function, space, and meaning into an organic whole. The core lies in explaining the dynamic interaction mechanism of temporal layering, functional layering, and meaning layering, rather than simple superposition. Through layered narrative reconstruction technology, this framework transforms isolated relics such as the Laojunmiao Oil Mine in Yumen City, Gansu Province (Laojunmiao Oil Mine), and Jiuquan Iron and Steel (Group) Co., Ltd. (JISCO) into a thematic narrative network, realizing the organic integration of historical depth and contemporary significance. It defines industrial heritage as "a vessel for the flow of cultural meanings," promoting a paradigm shift in industrial heritage from static specimens to dynamic memory ecosystems within civilization.

Keywords: *Hexi Corridor; Industrial Heritage; Heritage Corridor; Layered Landscape Perspective; Industrial Memory; Spatial Narrative*

Introduction

Global cultural heritage protection is undergoing a paradigmatic shift from individual static preservation to the integrated dynamic protection of cultural landscapes and heritage areas [1]. China's practice has evolved in parallel, progressing from the "point-based" preservation of cultural relics to the "plane-based" protection of historical districts and ultimately moving towards the systematic integration of "line-based" cultural corridors [2]. As a comprehensive concept integrating protection, ecological conservation, and regional development, heritage corridors provide a key theoretical fulcrum for interpreting the in-depth cultural context of scattered heritage sites [3]. The Hexi Corridor, a golden passage of the Silk Road stretching between the Qilian Mountains and the Beishan Mountains, not only embodies iconic cultural landmarks such as the Mogao Grottoes in Dunhuang but also engraves the collective memory of New China's industrialization: industrial heritage sites, including Laojunmiao Oil Mine, JISCO, and Jiuquan Satellite Launch Center, have jointly constructed the "New China Industrial Landscape" spanning from industrial foundation-laying to technological self-reliance [4].

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However, current protection practices are trapped in the museum-style preservation of individual buildings and structures (Dong Hailong, 2024), with value interpretation fragmented into isolated pieces that fail to be embedded in the dual context of the Hexi Corridor's millennia-long history of cultural exchange and national construction narratives [5], [6]. Such fragmented protection not only dissolves the organic connection between heritage, geographical context, and social memory but also causes the overall value to fall into obscurity amid regional transformation needs.

The deepening of national strategies has injected momentum into breaking the deadlock. The 14th Five-Year Plan for Cultural and Tourism Development advocates systematic protection and adaptive reuse, while the 2024 Implementation Plan for the Construction of the Hexi Corridor National Heritage Route directly requires the establishment of a cross-regional heritage corridor network [6]. Existing studies have accumulated experience in spatial analysis and tourism development in the construction of linear heritage corridors such as canals and ancient roads [7], [8], but holistic exploration of corridors for industrial heritage in the Hexi Corridor remains inadequate—current achievements either focus on single-value evaluation or are confined to tourism competition and cooperation models [5], failing to reveal the intrinsic mechanism of industrial heritage as linear cultural landscapes: the layered narrative connections between material remains, historical functions, and collective memory in space [9].

This study breaks through the traditional single-site or regional paradigm and proposes a "function-space-memory" three-dimensional integrated framework. The functional dimension analyzes the dynamic roles of heritage in historical scenarios such as production, transportation, and defense, as well as its potential for contemporary transformation; the spatial dimension draws on Lefebvre's theory of spatial production to examine the geographical distribution of heritage sites, landscape sequences, and their interaction with the natural environment, revealing their network characteristics as linear infrastructure; the memory dimension focuses on collective social memory and emotional identity, exploring how narrative design and community participation can transform physical spaces into perceivable places of meaning [10]. This framework defines the heritage corridor as "a vessel for the flow of cultural meanings," aiming to promote the transition of industrial heritage in the Hexi Corridor from "discrete sites" to "coherent narrative landscapes."

Theoretically, this study deepens the interdisciplinary theory between industrial heritage and linear cultural heritage, constructing a more explanatory multidimensional analytical model; practically, it provides operational paths for national strategic plans, contributes to the construction of regional ecological security barriers, people-to-people exchanges under the Belt and Road Initiative, and the revitalization of old industrial bases, thus offering the "Hexi Corridor paradigm" for the protection of linear industrial heritage worldwide.

Results and discussion

Landscape characteristics and functional orientation of industrial heritage in the Hexi Corridor

Type classification

The main classification characteristic of industrial heritage is the type of industry (Table 1).

Metallurgical Industrial Heritage: Centered on the smelting of non-ferrous metals such as nickel, copper, and cobalt, it is the most representative type of industrial heritage in the Hexi Corridor [14]. Jinchuan Nickel-Cobalt Mine is a rare world-class symbiotic ore deposit dominated by nickel and serves as China's largest nickel production base. As the largest carbon steel and stainless steel production base in Northwest China, JISCO boasts industrial relics including the grain depots of Jingtieshan Mine, Soviet-style buildings, blast furnaces, and production lines, which have witnessed the development of China's iron and steel industry.

Table 1. Classification of industrial heritage types in the Hexi corridor

Industry type	Core industry	Representative heritage	Historical value
Metallurgical industrial heritage	Smelting of non-ferrous metals such as nickel, copper, and cobalt; production of carbon steel and stainless steel	1. Jinchang Nickel-Cobalt Mine (a rare world-class symbiotic non-ferrous metal deposit dominated by nickel). 2. JISCO (grain depots of Jingtieshan Mine, Soviet-style buildings, blast furnaces, and production lines).	1. Jinchang Nickel-Cobalt Mine is China's largest nickel production base. 2. JISCO is the largest carbon steel and stainless-steel production base in Northwest China, witnessing the development of China's iron and steel industry.
Petrochemical industrial heritage	Oil exploration, extraction, and processing	1. Laojunmiao Oil Mine of Yumen Oilfield (drilled in 1939, China's first mechanical oil production well). 2. Ruins of the refinery (built in 1941), cave dwellings in the Shiyou River Gorge, and Iron Man Wang Jinxi Memorial Hall.	1. Known as the cradle of China's modern petroleum industry. 2. Produced a total of 250,000 tons of oil during the War of Resistance against Japanese aggression, accounting for over 90% of China's total crude oil output in the same period, making an important contribution to the victory of the War of Resistance.
Electric power industrial heritage	Construction and operation of hydropower stations	1. Yanguoxia Hydropower Station (concrete wide-jointed gravity dam, straw-soil cofferdam technology, etc.). 2. Liujiaxia Hydropower Station (dam, underground powerhouse, 330 kV switchyard).	1. Yanguoxia Hydropower Station is the first modern hydropower station on the main stream of the Yellow River. 2. Liujiaxia Hydropower Station is New China's first million-kilowatt large-scale hydropower station, with both power generation and national defense strategic significance. 3. Represent the highest level of China's hydropower construction and witness the development of the energy industry.
Light industrial heritage	Traditional brewing techniques, traditional Chinese medicine (TCM), and pharmaceutical production	1. Liangzhou Vinegar Culture Industrial Park, Gansu Tiaoshan Distillery (large-scale production buildings with the style of the 1990s).	1. Reflect the local characteristic industrial culture.

Petrochemical industrial heritage: Focused on oil exploration, extraction, and processing, it is the earliest type of industrial heritage in the Hexi Corridor. The Laojunmiao Oil Mine of Yumen Oilfield (drilled in 1939), as China's first mechanical oil production well, is hailed as the cradle of China's modern petroleum industry. The ruins of the refinery (built in 1941), the cave dwellings in the Shiyou River Gorge, and the Iron Man Wang Jinxi Memorial Hall form a complete petroleum industrial heritage system [15]. During the War of Resistance against Japanese Aggression, Yumen Oilfield produced a total of 250,000 tons of oil, accounting for over 90% of China's total crude oil output in the same period, making an important contribution to the victory of the War of Resistance.

Electric power industrial heritage: Centered on the construction and operation of hydropower stations, it is an important representative of the energy industry in the Hexi Corridor. As the first modern hydropower station on the main stream of the Yellow River, Yanguoxia Hydropower Station's core components include a concrete wide-jointed gravity dam, straw-soil cofferdam technology, early hydraulic turbine runners, and a remote monitoring system after automation transformation [16]. Liujiaxia Hydropower Station, the first million-kilowatt large-scale hydropower station in New China, consists of core components such as the dam, underground powerhouse, and 330 kV switchyard, all with both power generation and national defense strategic significance. These electric power industrial heritage sites not only represent the highest level of China's hydropower construction but also witness the development of the energy industry.

Light industrial heritage: Focused on traditional brewing techniques, it reflects the local characteristic industrial culture. The Liangzhou Vinegar Culture Industrial Park and Gansu Tiaoshan Distillery preserve large-scale production buildings in the 1990s architectural style, including key structures such as brewing workshops, wine storage facilities, and water towers, which embody the historical changes in the wine-brewing industry [17].

Identification of landscape characteristics of industrial heritage in the Hexi Corridor

Macro linear pattern: the trinity of "Resources-Transportation-Cities." The most prominent landscape feature of industrial heritage in the Hexi Corridor lies in its strong linear distribution pattern [19]. This pattern is not accidental but the result of the combined effect of resource endowments, national strategies, and geographical corridors (Fig. 1).

Fig. 1. Distribution map of industrial heritage in the Hexi Corridor, Gansu Province

Industrial activities unfold strictly along the east-west transportation arteries of the corridor (such as the Lanzhou-Xinjiang Railway, national highways, and ancient Silk Road routes), forming a clear "industrial backbone." Resource points (oil mines and mines), processing bases (oil refineries, iron and steel plants, and chemical factories), and the industrial and mining cities born therefrom (Yumen, Jiayuguan, and Jinchang) are highly spatially coupled, constituting a linear sequence of "resource extraction—primary processing—urban services." This pattern transforms industrial heritage from isolated points into a linear heritage system embedded in the regional geographical and transportation context, whose protection and interpretation must be considered at the scale of the entire corridor.

Meso Urban Form: In-depth Binding of "Establishing Enterprises Near Mines and Building Cities Around Enterprises." At the meso scale, the core industrial cities in the Hexi

Corridor present a unique landscape characterized by "high integration of production space and living space and interlocking of urban texture and industrial processes" [20]. Data indicate that cities such as Yumen, Jiayuguan, and Jinchang were all born and developed following the model of "establishing enterprises near mines and building cities around enterprises." This means that the urban spatial structure, functional zoning, road networks, and even social relations were initially planned and constructed to serve specific industrial production. Factories, residential areas, and supporting service facilities often form a relatively complete and introverted "work-unit community." This in-depth binding makes industrial heritage not only relics of production facilities but also a core part of the urban historical landscape, with its heritage value closely linked to urban identity.

Micro Landscape Units: A Collection of Identifiable Industrial Landscape Elements. At the micro scale, although detailed information on the spatial form of specific factories is lacking, based on the general laws of industrial production and the layered landscape theory, it can be inferred that their landscapes are composed of the superposition of various identifiable elements [21]. These include the core production layer (such as derricks, smelting furnaces, workshops, reaction towers, and launch pads); the transportation network layer (special railway lines, oil pipelines, mine cart tracks, and factory roads); the energy and infrastructure layer (water towers, substations, and cooling ponds); and the supporting living facilities layer (workers' dormitories, clubs, schools, and hospitals). These elements, on the natural substrate of gobi and oases, jointly shape highly recognizable industrial landscape units. Their technical aesthetics are reflected in the visual impact of grand scales, repetitive structures, and functionalist forms, serving as the materialized manifestation of engineering technology and national will in a specific era.

Innovation engine for economic transformation and space for experiential economy

Facing the challenges of resource depletion or industrial upgrading, the reuse of industrial heritage provides an important path for the transformation of resource-based cities. Its function can be positioned as an innovation engine for regional economic development [23]. Specific models include:

Cultural education and exhibition: Renovated into thematic museums, industrial heritage parks, and patriotic education bases to develop research tourism.

Creative industries and commercial services: Updating idle workshops and warehouses into creative studios, design centers, characteristic hotels, and catering-commercial complexes.

Immersive cultural tourism and experiential economy: Utilizing unique industrial spaces and combining new media technologies to develop immersive tourism products such as "underground exploration," "spaceflight simulation," and "smelting process experience," and creating themed cultural and tourism routes.

Spatial link for regional linkage and catalyst for vitality

As nodes on the heritage corridor, the functional realization of individual industrial heritage relies on regional linkage. They should serve as catalysts to bridge fragmented urban spaces and activate regional vitality. By constructing non-motorized transport systems (footpaths, cycling lanes, and sightseeing trains) and special tourism transport lines connecting various nodes, scattered heritage sites are linked into navigable and perceptible linear experience spaces. Meanwhile, relying on core heritage nodes, it radiates to drive the renewal of surrounding communities, the activation of traditional villages, and the development of agricultural tourism, forming circular development structures such as "heritage core area – cultural tourism service belt – ecological agricultural area" to promote the coordinated revitalization of the entire corridor region.

Heritage corridor theory: concept, development, and industrial

Heritage protection framework

Theoretical origin: from the "greenway" movement to regional protection strategies

Since the maturity of the "Greenway" theory in the 1960s, heritage protection in the United States has also begun to develop regionally. Based on the "Greenway" theory, the heritage corridor theory has gradually taken shape, which has provided new ideas for the protection and renewal of linear cultural heritage and industrial heritage belts [27].

In 1959, William H. White first proposed and used the concept of "Greenway" in his book Protecting Open Space in American Cities. Charles Little interpreted the "Greenway" theory in his book Greenways for America, and in 1975, Little published a report on "Greenline Park." This report further laid the foundation for the model of the heritage corridor theory and paved the way for its birth [28]. In 1984, the United States established its first national canal heritage corridor and enacted a special protection law for it, namely the Illinois and Michigan Canal National Heritage Corridor Act of 1984. Since then, the regionalization trend of heritage protection has strengthened, which means the official establishment of the concept of heritage corridors and the development of research on the heritage corridor theory [29]. In 1995, Searns pointed out in his book Greenways that the heritage corridor theory is different from the Greenway theory, further explaining the heritage corridor theory and emphasizing that it is a linear landscape integrating various special cultural resources [30].

The research on the heritage corridor theory in China began in 2001. Professor Wang Zhifang first introduced this theory into the domestic academic circle, explaining its theoretical connotation through American cases and revealing its enlightenment for China's heritage protection. After 2006, theoretical research showed a significant growth trend: Li Wei proposed a protection strategy framework for the Grand Canal from a macro perspective; Zhu Qiang systematically discussed the key issues of heritage corridor construction and the levels of industrial heritage protection; Li Chuangxin took the Silk Road as an example to construct a resource-based tourism cooperative development model, building a practical system from five dimensions: space, government, industry, positioning, and benefit-sharing [31]. Currently, the heritage corridor theory has been widely applied in the protection practice of various types of heritage, such as cultural heritage, industrial heritage, the Grand Canal, railways, and the Ancient Tea Horse Road. Its core value lies in integrating material and intangible heritage elements through linear spatial narration, realizing the organic unity of historical context inheritance and regional sustainable development, and providing an innovative paradigm with both theoretical depth and practical breadth for contemporary heritage protection.

Core connotation: integrity, linearity, and multi-functional integration

The linear spatial characteristic of heritage corridors enables them to transcend the limitations of traditional areal heritage areas. By organically connecting scattered historical and cultural relics with natural landscapes, they form a continuous narrative axis based on historical logic or functional connections, rather than a simple physical connection [32]. This strip-shaped distribution not only strengthens the spatial relevance of heritage resources but also constructs an organic whole covering both material and intangible elements, allowing historical memories and cultural contexts to be sustained in a dynamic space (Fig. 2).

Its scale and scope demonstrate high flexibility – it can either focus on short-distance transportation corridors within cities or expand into cross-regional long-distance networks. For example, the Blackstone Canal National Heritage Corridor in the United States stretches 14 – 40 kilometers, while the Erie Canal National Heritage Corridor spans 843 kilometers, connecting the vast watershed of the Hudson River and Lake Erie. These fully reflect the adaptability and diversity of heritage corridors in terms of spatial scale [33].

The construction of heritage corridors requires multi-disciplinary collaboration to advance systematic protection strategies, covering multiple dimensions such as historical restoration, ecological governance, cultural activation, tourism development, and community participation. It aims to achieve the organic unity of the principle of holistic protection, the logic of linear spatial narration, and the integration of multi-functional values [34]. By strengthening the relevance between heritage nodes, optimizing non-motorized transport systems and interpretive systems, and promoting the adaptive reuse of heritage buildings, heritage corridors not only serve as living carriers of historical context but also transform into sustainable engines driving the coordinated development of regional ecology, economy, and culture, providing an innovative paradigm for the transformation of the contemporary value of cultural heritage.

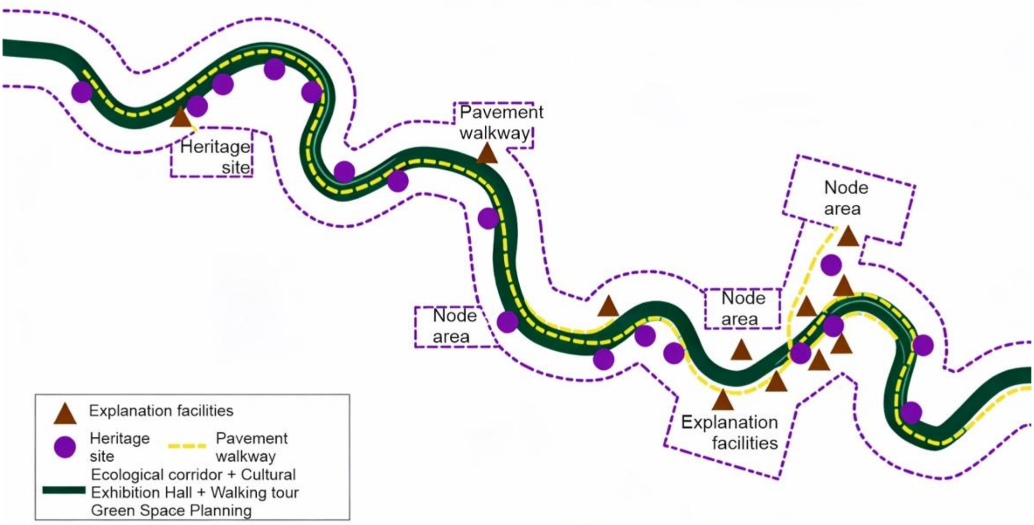


Fig. 2. Schematic diagram of heritage corridor structure (Source: Drawn by the author)

Integrated application and expansion: systematic framework for industrial heritage protection

Industrial heritage, especially that along railways, canals, and pipelines formed due to resource development and product transportation, inherently possesses a "corridor" attribute in terms of spatial distribution and functional connections (Table 2). The heritage corridor theory provides a highly operable and systematic framework for the protection of such heritage. Its application models are mainly reflected in the following aspects:

Constructing a multi-level spatial system: It is usually planned at three levels: macro (regional corridor), meso (urban or thematic area), and micro (specific heritage node), forming a spatial protection and utilization pattern integrating points, lines, and areas.

Implementing a multi-element integration strategy: Closely combining elements such as the heritage system, green corridors, transportation organization (e.g., footpaths, and bicycle lanes), and interpretation systems, this is collectively referred to as the "four-in-one" construction model. It ensures the simultaneous realization of cultural narration, ecological connectivity, tourist experience, and educational functions.

Promoting dynamic adaptive renewal: While protecting the historical authenticity of industrial relics and the integrity of industrial style, it emphasizes scientific functional replacement and adaptive reuse. This transforms abandoned industrial spaces into cultural and creative venues, tourism and leisure facilities, or public activity areas, reintegrating them into the urban fabric.

Table 2. Practical cases of heritage corridors (Source: Drawn by the author)

Name	Year	Country	Project Overview
Illinois and Michigan Canal National Heritage Corridor	1984	United States	The first national heritage corridor, with a total length of about 154 km, connecting the Illinois River and Lake Michigan
Blackstone River Valley National Heritage Corridor	1986	United States	The corridor is about 74 km long, running from Massachusetts to Rhode Island. It is recognized as the birthplace of the American Industrial Revolution. In 2014, the Blackstone River Valley National Historical Park was established
Delaware and Lehigh Navigation Canal National Heritage Corridor	1988	United States	The cradle of the American Industrial Revolution, a recognized industrial centre
Erie Canal National Heritage Corridor	2000	United States	The world's second-longest canal, with a total length of about 584 km. It is part of the New York State canal system and was expanded in the 1860s.
Route of Pilgrimage to Santiago de Compostela	1993	Spain	Also known as the Way of St. James, Europe's first cultural travel route spreads across Europe; after expansion, the total length is about 1,500 km.
Planning of the Datong Ancient Great Wall Cultural Heritage Corridor	2019	China (Beijing Forestry University)	The project is planned as a cultural heritage corridor 258 km long, involving an area of 186 km². The plan includes ecological restoration, economic development, and tourism development and hopes to activate the development of living communities along the route through planning.
Constructing the Beijing-Hangzhou Grand Canal Heritage Corridor from a Cultural-Gene Perspective	2021	China (Beijing Forestry University)	Introduced the concept of "cultural genes" and applied the AHP (Analytic Hierarchy Process) method to evaluate the genes, dividing them into common-type and individual-type genes. Finally, these "genes" were applied to the protection of canal heritage in various districts of Beijing.
Silk Roads: Zarafshan – Karakum Corridor	2023	Tajikistan, Turkmenistan, Uzbekistan	Total length 866 km, composed of 34 heritage component parts, with very complex geographical landscapes.

Layered landscape theory: revealing the temporal depth and meaning accumulation of landscapes

Meaning accumulation of landscapes

Layered landscape: a historical perspective on temporal accumulation and meaning generation

The core idea of layered landscape originates from the "spatio-temporal superposition" analysis in geography and the concept of "Historic Urban Landscape (HUL)" advocated by UNESCO. It understands landscape as the result of the layered accumulation and superposition of cultural and natural values from different historical periods in a specific space [35]. This process is like a "thousand-layer cake," where each layer engraves the marks of a specific era, jointly shaping the complexity and richness of the contemporary landscape (Fig. 3).

The methodological essence of the layered landscape theory lies in its "human-land-time" multidimensional cognitive framework. It emphasizes examining the continuous evolution of spatial forms (synchronicity) along the main thread of time (diachronicity) and focuses on the role of "humans" as the subject of creation and evolution [36]. In practice, it often draws on Kevin Lynch's urban image elements, deconstructing the landscape into element layers such as points (landmarks, nodes), lines (paths), and planes (regions, boundaries) (Fig. 4).

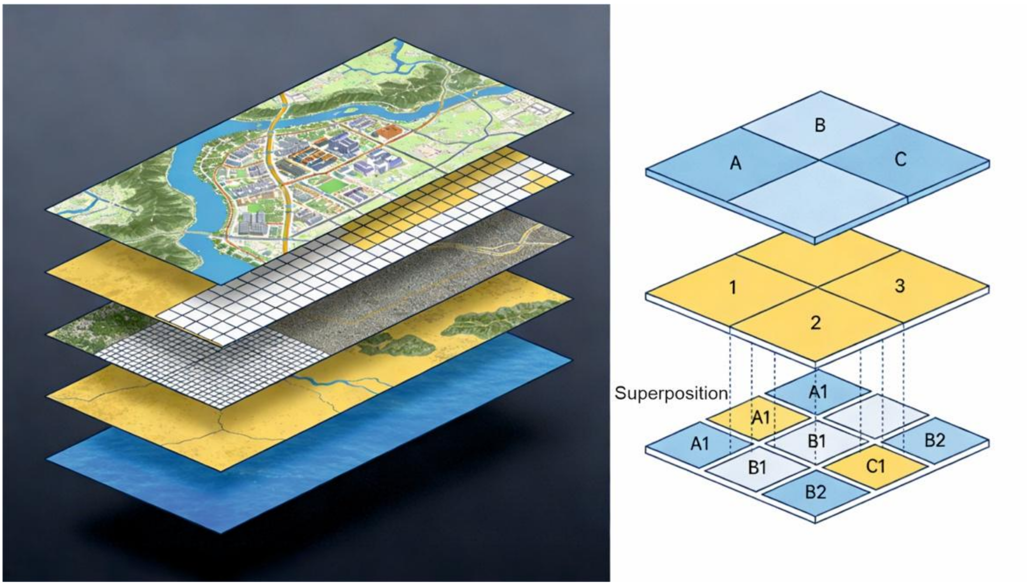


Fig. 3. Schematic diagram of layered landscape (Source: Drawn by the author)

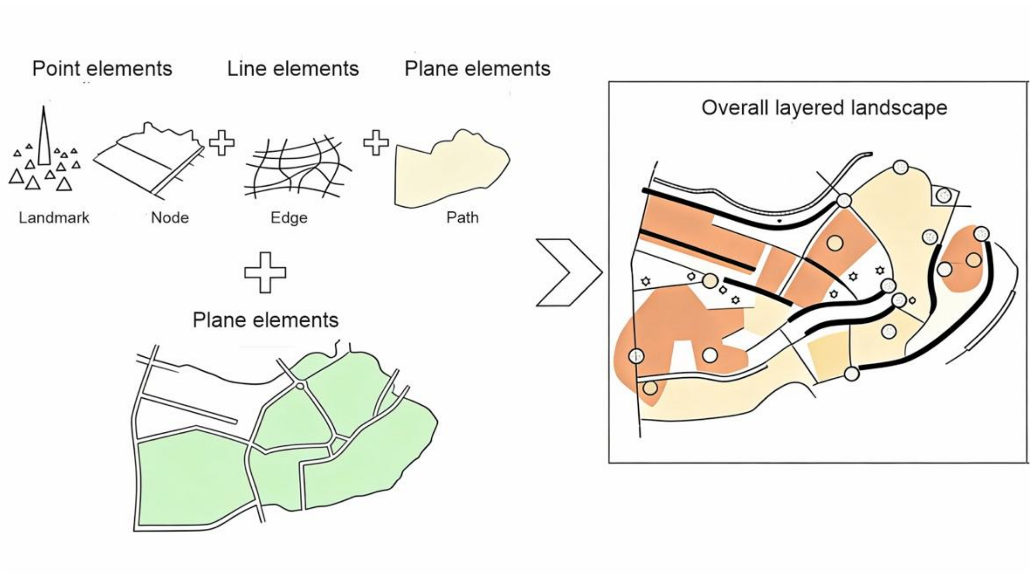


Fig. 4. Types, processes, and results of layered landscape elements (Source: Drawn by the author)

Through the superposition analysis of historical layers, it reveals the evolutionary trajectory and mechanism of the landscape [37]. For example, an industrial factory area may be superimposed on the site of an ancient post station, its road network may follow the alignment of historical trade routes, and the contemporary tourism interpretation system has endowed it with a new layer of meaning.

Applying this perspective to industrial heritage means that we not only see material entities such as workshops and equipment but also regard it as a dynamic mine of meaning-making [38]. Industrial activities are superimposed on the original agricultural or nomadic landscapes, changing the landscape form, water resource systems, and community structures; subsequent shutdown and abandonment have added layers of decline and natural erosion; current protection and reuse interventions are creating new layers. This “cumulative” characteristic makes the value of industrial heritage transcend the industrial aesthetics or technological-historical significance of its construction era and includes in-depth historical information that dialogues with earlier historical layers and subsequent change layers.

Core connotation of layered landscape

The triple superposition of time, function, and meaning: The spatial-temporal “superposition” theory regards any cultural landscape (including industrial landscapes) as a dynamically growing living organism, which is the result of the continuous superposition, accumulation, and integration of different historical periods, human activities, and cultural meanings in a specific space [39]. Its core consists of three interrelated dimensions:

Temporal superposition: Refers to the layered superposition of relics, traces, and marks from different historical periods on the time axis to form the material landscape. Like a geological section, each period leaves a unique “layer,” jointly composing the “historical stratum” of the place.

Functional superposition: Refers to the transformation, juxtaposition, or integration of the dominant or composite functions of the same space over time. For example, an industrial site may undergo a functional evolution of “production and manufacturing—abandonment and idleness—cultural exhibition.” The new functional layer does not completely replace the old one but engages in dialogue and coexistence with it.

Meaningful superposition: Refers to the cultural meanings, collective memories, and emotional values carried by a place, which are continuously endowed, reinterpreted, and enriched over historical development. It is the condensation and sublimation of material relics (temporal layer) and human activities (functional layer) at the spiritual level.

These three dimensions form an organic whole: temporal superposition is the material carrier, functional superposition is the dynamic process, and meaningful superposition is the core of value [40]. Together, they reveal that industrial heritage is not a static ruin but a living historical text carrying technological evolution, social changes, and collective memories.

Construction of the theoretical framework for the Hexi Corridor industrial heritage corridor

Based on this theory, the cognition of industrial heritage must follow the path of "element identification – layer decomposition – superposition analysis – mechanism interpretation." Firstly, systematically excavate material and intangible heritage elements; secondly, conduct layered processing of them according to time sequences (such as the initial period, development period, and transformation period) and spatial types (point, line, and surface elements); further, analyze the superposition modes of these layers (such as continuity, interruption, coverage, and integration); and finally, interpret the evolutionary logic of their “survival trajectory – internal mechanism – value cognition” [41]. In terms of technical support, GIS-based spatial superposition analysis and buffer analysis provide tools for the visual presentation of different historical layers, while design techniques such as “fragment rewriting” (synchronously presenting historical traces) and “contextual intertextuality” (associating with a broader historical background) have become specific strategies to reproduce such layered relationships in space [42].

Framework cornerstone: integration of dual-core theories and adaptation to the Hexi Corridor

The construction of the theoretical framework for the Hexi Corridor Industrial Heritage Corridor is rooted in the in-depth integration of two major theoretical systems and carries out key adaptations to regional characteristics.

Heritage corridor theory

Providing the skeleton for spatial organization and systematic integration, the core of the heritage corridor theory lies in integral protection, emphasizing the organic connection of scattered cultural resources through linear space to achieve the integration of cultural, ecological, recreational, and economic functions. Its classic construction process of "resource survey and value evaluation, GIS spatial pattern analysis, 'point-line-area' network generation, and comprehensive strategy formulation" provides a systematic methodology for dealing with the scattered but inherently related industrial heritage in the Hexi Corridor. For the Hexi Corridor, these skeletons need to particularly strengthen their integration capacity across geographical units and administrative boundaries to cope with the wide distribution of heritage sites from the Qilian Mountains to the Gobi Desert and the management reality of belonging to different cities and counties.

Layered landscape theory

Injecting the Soul of Temporal Depth and Meaning Interpretation of the Layered Landscape Theory regards heritage as a three-dimensional sedimentary body of time, function, and meaning. Its "space-time superposition" cognitive model and "layer decomposition – superposition analysis" technical path provide precise tools for interpreting the complex evolution of the industrial heritage in the Hexi Corridor from ancient smelting to modern aerospace and from production sites to spiritual landmarks. This theory requires the framework to go beyond the static recording of material remains and deeply explore and visualize the underlying historical strata, functional transformation trajectories, and collective memory coding. The three thematic layers of "Energy Epic," "Metallurgical and Chemical Engineering," and "Light Industry and Livelihood" identified earlier are the specific manifestations of meaning layering.

Dual-core intersection and adaptation to the characteristics of the Hexi Corridor

The intersection of the two has given birth to unique theoretical requirements in the context of the Hexi Corridor:

Complexity of the linear skeleton: The corridor is not only a physical connection but also a complex of narrative context and ecological corridors.

Extremity of layered analysis: It is necessary to handle extremely complex layered relationships with a long-time span, distinct spatial forms, and diverse meaning dimensions.

Necessity of dynamic narrative: The framework must support a dynamic and growing narrative mechanism that can accommodate the addition of new heritage layers in the future and the reinterpretation of existing memory layers.

Core framework: "Dual-Core Driven, Four-Step Progressive, Three-Axis Supported" model

Based on the above cornerstones, this paper proposes a "Dual-Core Driven, Four-Step Progressive, Three-Axis Supported" theoretical framework model for the construction of the Hexi Corridor Industrial Heritage Corridor. This model clarifies the entire process from basic cognition to implementation strategies and emphasizes the penetration and support of three dimensions: space, time, and meaning (Table 3, Fig. 5).

Table 3. Operation schematic of the "Dual-Core Driven, Four-Step Progressive, Three-Axis Supported" model (Source: Drawn by the author)

Step	Core Objective	Key Methods/Techniques	Hexi Corridor Adaptation & Outputs
Step 1: Resource identification and layered value assessment	Establish a heritage-resource database and complete value grading based on a layered perspective.	1. Resource survey: literature review, field investigation, and interview method. 2. Layer decomposition: decompose heritage elements into three categories of data layers—material layer, institutional layer, and spiritual layer. 3. Value assessment: build an AHP evaluation system covering historical, technological, artistic, social, and economic values; determine weights through expert scoring.	Output: a “one-map” database of industrial-heritage resources in the Hexi Corridor (GIS), with timestamps and attribute tags. The value-assessment results should reflect "layeredness." For example, Laojunmiao Oil Mine (1939) has an extremely high weight for historical value, while the launch tower structure of the Jiuquan Satellite Launch Center (partially modified) has prominent technological and symbolic value.
Step 2: Spatial Pattern Analysis and Corridor-Network Generation	Identify the spatial distribution patterns of heritage and scientifically generate an optimal heritage-corridor network.	1. Spatial analysis: use GIS kernel density analysis to identify clustering areas; use buffer analysis to define impact ranges. 2. Resistance-surface construction: integrate factors such as land use, terrain, transportation, and ecological sensitivity; use AHP to determine the weight of each factor and generate a composite resistance surface. 3. Corridor generation: treat high-value heritage sites as “sources,” apply the Minimum Cumulative Resistance model (MCR), and simulate potential optimal corridors connecting the sources.	Output: a heat map of industrial-heritage spatial distribution in the Hexi Corridor, a composite resistance map, and a potential heritage-corridor network map. The network should present an “axis-belt-branch” framework and identify key areas such as the “Jiayuguan-Jiuquan core area” and the “Yumen-404 national defense technology belt.”
Step 3: Layered Narratives and Themed Spatial Planning	Transform the linear spatial network into a cultural-experience corridor with stories and themes.	1. Theme-system construction: establish three core narrative themes – “Energy Epic,” “Metallurgical and Chemical Engineering,” and “Light Industry and Livelihood" (derived from the previous analysis). 2. Narrative-structure design: design a “linear chronological route" and an “emotional memory route.” 3. Carrier and route planning: plan three types of carriers – ‘object-place-event,” and organize themed touring routes.	Output: thematic planning map for the industrial-heritage corridor in the Hexi Corridor, a tiered interpretation-system plan, and narrative scene-design guidelines for core nodes (e.g., Yumen Laojunmiao), achieving an elevation from a “geographical corridor” to a “story corridor.”
Step 4: Protection Strategies and Implementation of Activation & Utilization	Formulate graded and classified protection measures and sustainable activation/utilization strategies.	1. Graded and classified protection based on the value assessment and preserved core heritage with “authenticity”; carry out adaptive reuse for general remains. 2. Multi-functional integration: explore models such as “industry + cultural tourism,” “industry + sci-tech innovation,” and “industry + ecology.”	Output: a graded protection list and map guidelines for industrial heritage in the Hexi Corridor, key-area renewal and renovation plans, and community-participation operation and management plans, ensuring the sustainability of both protection and development.

Dual-core driven

Heritage Corridor level: Drives the spatial systematicness and functional complexity of the framework. Ensures that protection practices move from individual to network and from a single cultural goal to the multi-dimensional coordination of culture, ecology, society, and economy.

Layered landscape level: Drives the historical depth and interpretive multi-dimensionality of the framework. Ensures that each evaluation, planning, and design is based on a precise interpretation of the heritage "strata," realizing the activation of memory and the contemporary translation of meaning.

Four-step progressive construction process

This process combines general methodology with specific practices in the Hexi Corridor to form an operable closed loop.

Three-axis penetration and support

The above four steps are not carried out in isolation but are always carried out under the interweaving of three axes:

Spatial Axis (Point-Line-Plane Network): Ensures that each step is implemented in specific spatial entities. From the value evaluation of individual points (points) to the generation of linear corridors (lines) and then to the planning of thematic areas (plan), the spatial scale continues to expand, but the integrity is always maintained.

Temporal Axis (Historical Stratum Sequence): Ensures that each decision respects temporal layering. Distinguish the values of different eras during evaluation, show the technical evolution sequence during planning, and allow dialogue between old and new during utilization, avoiding the flattening of historical information.

Meaning Axis (Memory Value Dimension): Ensures that the framework always points to the inheritance and reproduction of cultural meaning. Through narrative design, carrier translation, and activity planning, abstract values such as national memory, local identity, and technical epic are transformed into specific experiences that the public can perceive, participate in, and resonate with.

Reconstruction of industrial memory narrative: integration path from individual heritage to corridor system

Methodology: operational process of layered narrative reconstruction

The operational process of layered narrative reconstruction is performed in four steps (Fig. 6).

Step 1: Deconstruction of historical layers and identification of anchor points. Using historical geographic information system (GIS) methods, conduct an "archaeological stratigraphy"-style information stripping of the target heritage site. First, extensively collect factory histories, archives, drawings, oral histories, and remote sensing images, and establish discrete "time slices" in chronological order. Second, within each time slice, identify and mark key material spatial elements as "anchor points," such as the earliest built workshop, iconic production equipment, and core buildings that determine the factory layout. These anchor points are the material condensation of historical information in the current space and the spatial fulcrum for the development of the narrative. For example, for an iron and steel plant, it is necessary to deconstruct different material layers from different periods, such as "the foundation laying of the No. 1 blast furnace in 1958," "the workshop expansion corresponding to the introduction of continuous casting technology in 1978," and "the addition of dust removal systems for environmental protection transformation in 2000."

Step 2: Functional flow analysis and spatial translation planning. Based on clarifying the historical layers, analyze the evolutionary logic of spatial functions with the changes of the times. This includes the spatial organization of production processes, the evolution of workers' living area layouts, and the dynamic adjustment of the relationship between the factory area and the city. Based on this, plan contemporary functional translation schemes. The core of translation lies in establishing a "dialogical" rather than "substitutional" relationship between old and new functions.

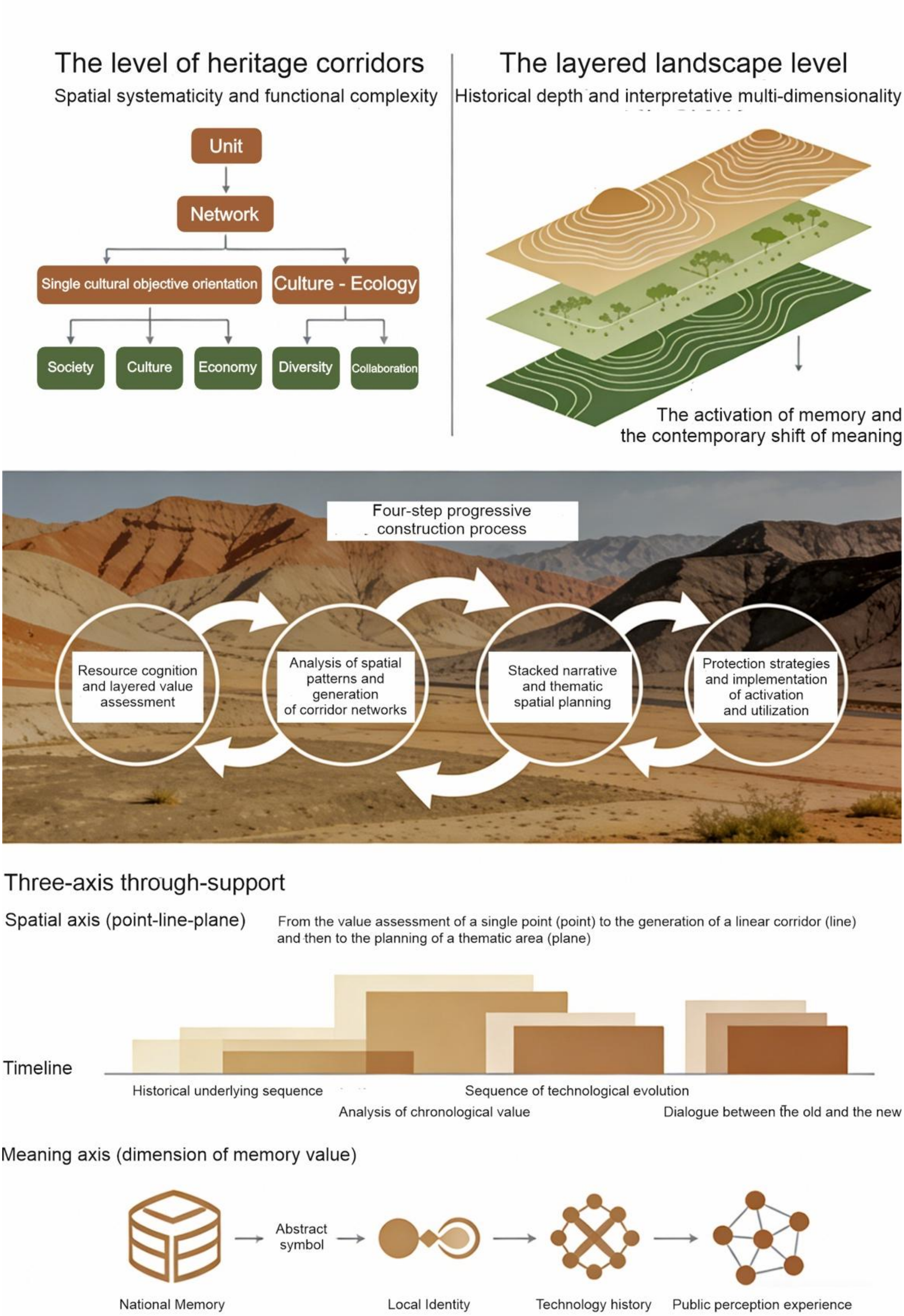


Fig. 5. Schematic diagram of the "Dual-Core Driven, Four-Step Progressive, Three-Axis Supported" model (Source: Drawn by the author)

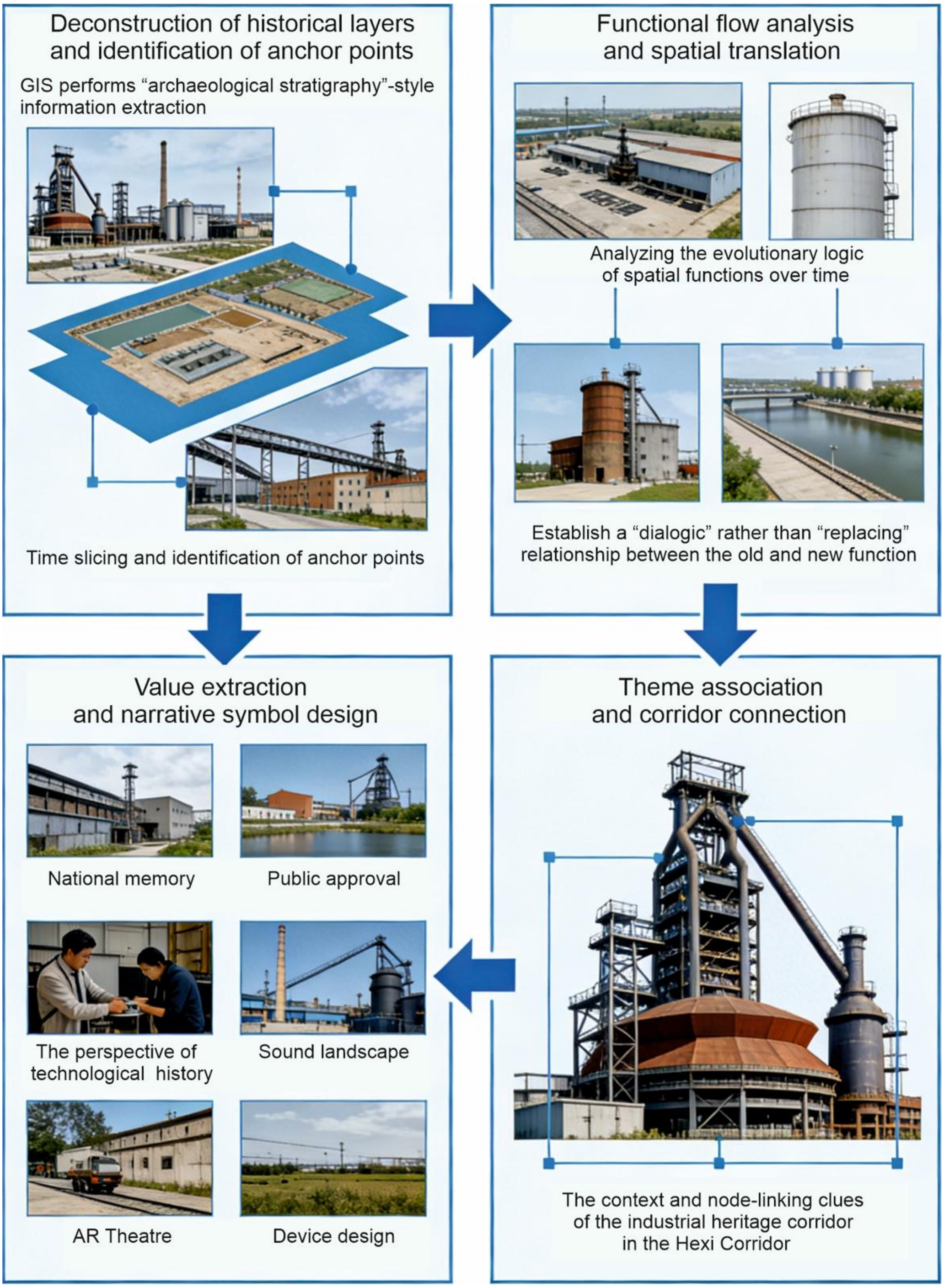


Fig. 6. Operational process of layered narrative reconstruction (Source: Drawn by the author)

For example, transform abandoned special railway lines into slow-moving landscape trails running through the factory area (continuation and transformation of linear transportation functions), convert large storage tanks into immersive exhibition spaces (poetic translation of storage functions into cultural display functions), and transform circulating water pools into ecological purification exhibition areas (sublimation of the concept from industrial circulation to ecological circulation). This step aims to answer the question: How to transform the original production logic of the heritage into a contemporary cultural logic that can be understood, experienced, and used by the public?

Step 3: Extraction of meaning and value, and design of narrative symbols. Deeply explore the collective memory and spiritual value carried by anchor points and functional spaces. This involves the extraction of meaning at three levels: national memory (such as the dedication spirit of the "eldest sons of the Republic"), local identity (such as the civic identity of the "Steel City" and the "Nickel Capital"), and technical epic (such as the innovative breakthrough of specific processes). Subsequently, transform these abstract meanings into perceptible narrative symbols and experience scenes. Symbol design should be concrete and interactive. For example, design an "industrial soundscape" of iconic production sounds (such as the roar of drilling rigs, the surge of crude oil, and workers' chants) and play them at fixed points; transform the story of a model worker into an interactive plot that is triggered at the workstation where he once worked; artistically combine a set of parts reflecting technological iteration into an installation sculpture telling the story of "evolution."

Step 4: Thematic connection and preset corridor linkage. After completing the layered narrative design of individual heritage sites, it is necessary to examine them in the macro context of the Hexi Corridor Industrial Heritage Corridor. Identify the core narrative theme of the heritage and evaluate its potential role in the linear narrative of the corridor. At the same time, preset "linkage clues" with other nodes on the corridor in the interpretation system, visual identity, and tour route design of individual heritage sites are established. For example, in the narrative of JISCO, indicate that its iron ore comes from Jingtieshan and sets up visual or information guidance to the next node, building "expectations" for tourists and making them perceive that they are in a larger story context

Technical path: constructing a hierarchical and classified protection system

Establishing a scientific, hierarchical, and classified system is the operational prerequisite for achieving differentiated and refined management. This system should deeply integrate the value cognition of stratified landscapes with the spatial assessment of heritage corridors.

The establishment of this system relies on a previously constructed multi-dimensional value assessment model based on the Analytic Hierarchy Process (AHP), which includes dimensions such as historical, technological, artistic, social, and ecological value. Through a combination of quantitative and qualitative evaluations, the "axis of meaning" from the theory of stratified landscapes is transformed into an operable basis for classification, ensuring that the intensity of intervention matches the value of the heritage (Table 4).

Stratified narrative reconstruction of typical cases

Starting point of the energy industry epic: the "chronostratigraphic" exhibition of the Yumen Laojunmiao Oil Mine

As the cradle of China's modern petroleum industry, the core of the narrative for the Yumen Laojunmiao Oil Mine lies in its unparalleled completeness of time stratification – this characteristic makes it a natural starting point for the "energy epic," and the reconstruction strategy should focus on the historical sedimentation in the form of a "geological profile." Instead of static displays in the style of traditional museums, an immersive narrative of on-site archaeology is adopted: taking the first oil well drilled in 1939 as the temporal anchor point, a radiative protection zone is demarcated, and multispectral scanning combined with 3D laser technology is used for high-precision data collection of key relics such as derricks, pumpjacks, and early oil pipelines. The aim is not only to document their form but also to analyze metal fatigue and corrosion layering, thus constructing an industrial archaeological stratigraphy map. Augmented Reality technology overlays traces of transformations from different periods (e.g., the wooden derrick of 1939, Soviet steel components from the 1950s, and automation modules from the 1980s), allowing the chronological history of Chinese petroleum technology to be layered directly onto physical equipment, rendering the historical trajectory tangible.

Table 4. Classification and protection system of industrial heritage in the Hexi Corridor (Image source: Drawn by the author)

Protection level	Definition criteria (based on layered value)	Intervention intensity	Hexi Corridor adaptation and output
Core protection (anchor points)	Temporal superposition: Landmark origin of turning point (e.g., Laojunmiao Oil Well in 1939). Meaningful superposition: Carrying national memory and core spirit (e.g., the "Two Bombs, One Satellite Spirit"). Spatial superposition: Key node in the corridor network with strong radiation.	Strict protection and preservation	Laojunmiao Oil Mine in Yumen: Protect the original site, original objects, and original state; establish a core protection zone; and restrict any construction that alters the historical style.
Key protection (thematic nodes)	Functional superposition: Representing typical technologies and processes of specific industrial categories. Meaningful Superposition: Condensing local identity and collective memory (e.g., worker communities). Spatial Superposition: Important station on the thematic narrative path.	Protection-oriented with compatible rational utilization	Early factory area of JISCO and carrier of the "Steel Growth Ring" light and shadow Corridor: Protect the main structure of industrial buildings and key equipment; allow adaptive transformation of internal spaces into exhibitions, theaters, etc. Landmark smelting facilities of Jinchuan Nickel-Cobalt Mine: Protect their industrial aesthetic characteristics; enable functional implantation combined with environmental education.
General protection and reuse (background environment)	Temporal/Functional Superposition: Reflecting ordinary production and living scenes with relatively universal value. Spatial Superposition: Constituting the texture part of the overall style of the heritage area.	Utilization-driven protection	Worker residential areas along the corridor (Gan Dalei rammed-earth building complex): Based on preserving the style, transform into homestays, community centers, etc. Abandoned railway branches and pipeline corridors: Transform into non-motorized trails and linear parks to enhance corridor connectivity.

The spatial translation of the core production zone transforms historical memory into a sensory environment. Abandoned oil storage tanks are reconstructed into a circular immersive "Petroleum Memory" theater, making use of their cylindrical acoustics to compose a symphonic piece based on drilling roars, the surge of crude oil, and workers' chants, with panoramic projection simultaneously presenting a spatiotemporal narrative from geological sedimentation to modern extraction. The pipe corridor system of the refinery is converted into an elevated viewing walkway, becoming a "visual gallery" for interpreting the spatial layout of the oil Mine heritage site. Meanwhile, the original form of "rammed earth" workers' dormitories is preserved, and everyday life scenes are restored through oral histories, anchoring the national memory of "arduous pioneering" and the local identity of "petroleum workers" in tangible objects and spaces – thus granting the historical narrative emotional depth.

The narrative endpoint clarifies Yumen's role as the starting point of the Hexi Corridor's "energy artery," visually presenting the regional storyline from Yumen's oil to Jinchang's nickel and copper smelting and its transportation along the Lanzhou-Xinjiang railway through a digital sand table. The exit design echoes the next site (such as Jinchang) through similar pipeline shapes or color elements, forming a symbolic narrative continuity. Through the organic integration of time stratification, spatial translation, and narrative linkage, this framework elevates the physical relics of industrial heritage into cultural genes, realizing a theoretical interweaving of historical depth and contemporary significance.

Metallurgical and chemical engineering as an urban symbiotic body: the "Function–Meaning" overlap of JISCO and Jiayuguan City

The symbiotic relationship between JISCO and Jiayuguan City provides a typical example of the theory of "industry-city symbiosis." The core of its narrative reconstruction lies in revealing the layered evolutionary mechanism of industrial functional space – the dynamic process from resource extraction to city formation – which perfectly interprets the interactive logic of "functional layering" and "meaning layering."

The construction of a spatial conduction chain breaks through the plant boundary, visualizing the spatiotemporal context of "Jingtie Mountain (resource site) – JISCO (processing site) – Jiayuguan City (urban site)" via GIS technology: iron ore discovery (point) drives steel plant expansion (plane) through railway transportation (line), ultimately giving rise to the establishment of the city (volume), thus forming a three-dimensional narrative of the birth of a steel city.

The "production rings" of the plant space are translated into a key strategy. The gantry crane tracks of the early rolling workshop are transformed into a light-and-shadow art corridor, with production milestone data embedded into the ground; at night, the light sequence flows like a river of time. The dust removal tower is converted into an "Air Purification Museum," with the tower body displaying real-time air quality data compared with historical records, turning the evolution of environmental protection technology into a perceptible "breathing experience."

Public spaces are systematically implanted with a symbolic system of steel: the visual form of splashing molten steel, the sound textures of rolling rhythms, and the daily imprint of work-shift whistles are artistically refined and integrated into urban sculptures, neighborhood signage, and ambient sound effects.

Through the "Steel Art Festival," citizens use scrap materials for creation, fusing personal memories, family stories, and industrial matter – elevating the "steel city" identity from historical sediment into a continually growing cultural gene.

This framework, through the stratified translation of space and symbols, enables industrial heritage narratives to transcend physical relics and transform into a dynamic generative mechanism of urban identity.

Integrated nourishment of light industry and livelihood: narrative reconstruction of the Zhangye City–Wuwei City agricultural and by-product processing cluster

As the core carrier of light industrial heritage in the Hexi Corridor, the Zhangye City–Wuwei City agricultural and by-product processing cluster holds narrative value in revealing the deep mutual construction between agrarian civilization and modern living space – its dynamic logic of "integration" and "nourishment" not only surpasses the static documentation of single production functions but also elevates everyday craftsmanship into a living mine of cultural symbiosis.

Through systematic translation of traditional craft spaces such as Liangzhou smoked vinegar and Tiaoshan liquor, workshops, markets, and community life scenes are reconstructed into immersive narrative units: traditional brewing processes are reactivated through interactive experiences, and historical commercial networks are overlaid and presented via digital technologies, allowing the nourishing role of craft in shaping local culinary culture to be concretely expressed; public spaces are embedded with visual elements such as wheat ear patterns and grain silo symbols, seamlessly integrated into the urban fabric, transforming "rural memory" into an environment-based narrative perceptible in daily life.

This narrative mechanism realizes an organic layering across three dimensions:

On the temporal layer, ancient techniques and contemporary life textures interweave and co-exist within space; on the functional layer, production spaces are poetically translated into cultural experience spaces, dissolving the boundaries between industry and livelihood; on the meaning layer, the inheritance of "objects" (e.g., brewing tools, product forms) is elevated to the emotional identification of "people" (e.g., family stories, community collective memories), thereby transforming "integration" from a historical concept into an ever-growing cultural gene.

Through carriers such as intangible heritage workshops and lifestyle festivals, citizens engage in creative reinterpretation of traditional crafts, blending personal memories, everyday scenes, and industrial materials, endowing "nourishment" with dynamic vitality.

The embedding of the light industry and livelihood theme not only fills the gap of the livelihood dimension in the narrative of Hexi Corridor's industrial heritage but also reveals, on a civilizational level, the profound value of industrial heritage as a source of daily nourishment: it is both a modern continuation of agrarian civilization and a carrier of emotional connection in contemporary society.

Within the narrative loop of "energy–metallurgy–livelihood," this theme elevates industrial heritage from a historical specimen to a dynamic container of cultural resilience and everyday warmth, injecting sustainable civilizational vitality into the linear heritage corridor.

From individual sites to corridors, thematic narrative network generation

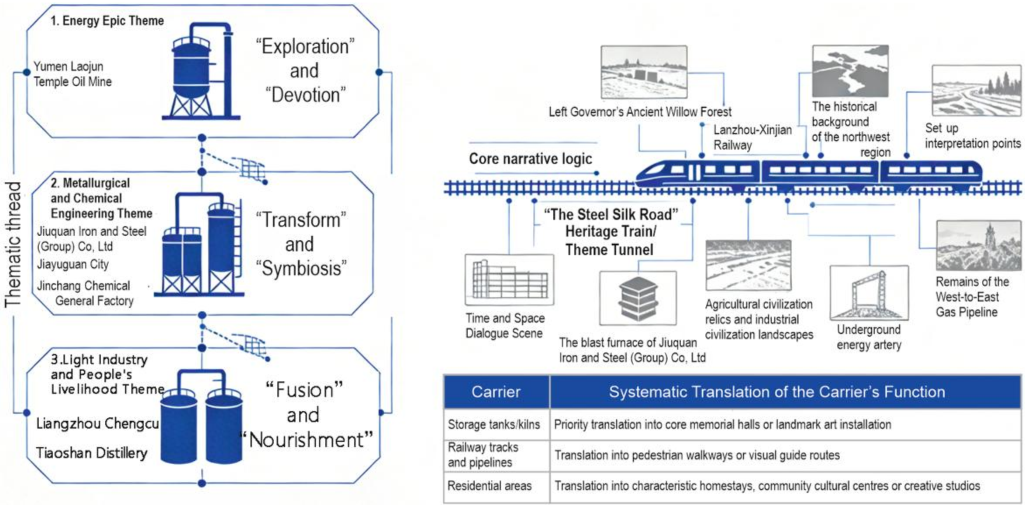
After completing the stratified narrative reconstruction of the above individual heritage sites, the final step is to integrate them into the overall narrative network of the Hexi Corridor industrial heritage corridor. This relies on the implementation of the previously constructed three-dimensional matrix of theme path carrier.

Vertical integration of thematic clues anchors the five typical cases, respectively, to the three major narrative themes:

- Energy epic theme centered on Yumen Laojunmiao Oil Mine, starting point with a narrative focus on pioneering and dedication;
- A metallurgical and chemical engineering theme-centered plan on JISCO, Jiayuguan City midpoint, and Jinchang Chemical Complex Nickel Capital with a narrative focus on transformation and symbiosis;
- The light industry and livelihood theme is centered on the agricultural and by-product processing cluster from Zhangye City-Wuwei City, with a narrative focus on integration and nourishment.

Spatial weaving of narrative paths takes the Lanzhou-Xinjiang Railway, a historically significant transportation trunk line, as the central narrative spine. Design a Steel Silk Road heritage train or themed greenway to link heritage sites along the line. In the path design, intentionally create a space-time dialogue when the train passes by the ancient poplar tree group Zuo Gong Liu planted during Zuo Zongtang's Western Expedition. The in-car audio explanation may introduce the historical background of modern industrial civilization entering the northwest when the train stops at Jiuquan Station. The sightline may be guided toward the distant Jiuquan blast furnace, forming a visual juxtaposition of agrarian civilization relics and industrial civilization landscapes. In addition, use the remnants of linear projects such as the West-East Gas Pipeline to construct a metaphorical branch line of underground energy arteries by setting up landscape markers on the ground to trace the direction of the pipeline and setting up interpretation points at key pump station sites to reveal how invisible energy flows shape the surface economic geography.

Systematic translation checklist of narrative carriers: formulate a unified carrier translation guideline to ensure the overall narrative style coordination of the corridor. For example, large structures such as storage tanks and blast furnaces are preferably translated into core memorial halls or landmark art installations. Linear elements such as railway tracks and pipelines are translated into slow traffic walkways or visual guiding lines. Precision spaces such as control rooms and laboratories are translated into immersive experience pavilions or science classrooms. Residential area buildings are translated into themed homestays. Community cultural centers or creative studios, at the same time, develop a unified visual identity system of Hexi Industrial Memory and a smart interpretation platform so that tourists can obtain the stratified narrative information of all nodes through one app, realizing a coherent experience across sites and across themes (Fig. 7).



Carrier	Systematic Translation of the Carrier's Function
Storage tanks/kilns	Priority translation into core memorial halls or landmark art installation
Railway tracks and pipelines	Translation into pedestrian walkways or visual guide routes
Residential areas	Translation into characteristic homestays, community cultural centres or creative studios

Fig. 7. Schematic diagram of the thematic narrative network generation (Source: Drawn by the author)

Through the above steps, the individual industrial heritage sites scattered across the nearly one-thousand-kilometer range of the Hexi Corridor are liberated from isolation; they are re-encoded through stratified narratives, becoming different chapters of a grand epic jointly telling the story of China's industrial civilization about resources, strength, wisdom, and dreams and finally integrated into a heritage corridor system with strong cultural cohesion and experiential appeal.

Conclusions

The construction of the industrial heritage corridor in the Hexi Corridor marks a paradigmatic shift in industrial heritage conservation—from static specimens to carriers of civilizational narratives. This study centers on a tri-dimensional framework of "function-space-memory" and, for the first time, systematically deconstructs the dynamic evolution mechanism of industrial heritage as a "historical stratigraphy." It breaks through the long-standing fragmentation in domestic research, which has focused either on micro-level value assessments (such as Liu Boying and Li Kuang's analyses of the composition of industrial heritage) or on specific types of corridor practices (such as Zhu Qiang and Yu Kongjian's spatial organization of the Grand Canal heritage corridor). The theoretical innovation lies in the organic integration of spatial systems theory in heritage corridors and the temporal narrative philosophy of stratified landscapes, elevating industrial relics from material remains to living sites that carry national memory. The "energy epic" of Yumen Oilfield, the "production-city symbiosis" of JISCO, and the "integrated nourishment" of

Zhangye City and Wuwei City collectively compose a civilizational sublimation trajectory of "technology-energy-spirit," profoundly revealing the deep logic of industrial civilization embedded in regional cultural contexts.

Distinguished from domestic and international approaches that focus on spatial connectivity or technical restoration, the theoretical depth of this framework lies in defining heritage corridors as "containers for the flow of cultural meaning." Through the "dual-core drive, four-step progression, and three-axis support" model, industrial memory is transformed from historical archives into a perceivable and growing contemporary narrative. This dimensional elevation not only responds to the strategic call for systematic integration in the Implementation Plan for the National Heritage Route in the Hexi Corridor but also reconstructs the value dimension of industrial heritage on a civilizational level: ecological restoration transforms abandoned industrial sites into green infrastructure; economic revitalization activates regional vitality through immersive experiences; and cultural identity continues to grow through symbols such as "steel rings of time," achieving an organic unity of protection, development, and identity.

In the future, the Hexi Corridor Industrial Heritage Corridor will evolve into a "dynamic memory ecosystem." On the technological level, it will rely on digital twin technology to construct an interactive "historical layering" system, allowing visitors to independently explore the correlations among "space-events-memory" across different time periods. On the governance level, it will explore a multi-stakeholder co-governance model involving "government-enterprise-community-academia," promoting trans-civilizational narrative connections with heritage networks along the Belt and Road Initiative (such as the Central Asian Mining Corridor). On the theoretical level, this framework will be extended to regions such as the Northeast's old industrial base, thereby forming a theoretical system for industrial heritage conservation with Chinese characteristics. This evolution enables industrial heritage to transcend localized conservation practices and become a "geographical annotation" and "spatial epic" of China's civilizational leap from an agrarian society to modern industrial civilization. Within the grand narratives of the Belt and Road Initiative and ecological civilization construction, it continuously activates the spiritual genes of "pioneering, dedication, and innovation," contributing a civilizational paradigm to the revival of post-industrial regions globally.

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