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Research on current status and dilemmas of revitalization and utilization of China's large archaeological sites from the perspective of environmental design

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Abstract. As a crucial physical carrier of Chinese civilization, large archaeological sites are squeezed jointly by urbanization and heritage conservation policies. From the perspective of environmental design, this paper systematically sorts out three theoretical paradigms for the revitalization of large archaeological sites, namely value continuity and living heritage conservation, spatial justice and social symbiosis, as well as genius loci and the production of space. Three core intervention approaches are summarized correspondingly: landscape integration, urban-rural symbiosis coupled with settlement infilling, and digital transcription empowered by digital technologies. Relevant research demonstrates that despite fruitful achievements achieved in current revitalization practices, the preservation work is trapped in practical predicaments including constrained evaluation system, ambiguous design boundaries, homogenized cultural narratives, superficial spatial transcription, bonsai-style development lacking daily living functions, imbalanced benefit allocation and restrictive administrative management mechanisms. To realize win-win outcomes of sustainable cultural heritage revitalization and high-quality urban-rural development, future efforts shall strengthen holistic and systematic thinking, integrate large-site conservation into territorial spatial planning, expand immersive virtual-real interactive experience via digital technologies, and institutionally establish a humanism-centered community co-construction mechanism.

Keywords: environmental design, large archaeological sites, revitalization and utilization, living heritage conservation, urban-rural symbiosis

1. Introduction

As a core research category in China's cultural heritage conservation field, the term "large archaeological sites" refers to comprehensive landscape complexes featuring prominent historical values, enormous spatial scale and integrated coexistence with surrounding natural environments. Such heritage not only furnishes critical physical evidence for the *Chinese Civilization Origin Project*, but also serves as the physical cornerstone documenting regional spatial evolution and historical memories. Nevertheless, driven by global urbanization and regional economic integration, large archaeological sites are confronted with unprecedented existential threats. Frequent spatial overlaps between sprawling urban construction and site protection redlines

lead to encroached land and damaged historical landscapes on one hand; on the other hand, long-term stereotyped perception framing large archaeological sites as static and untouchable relics hinders the release of their social productive potential and cultural spillover effects, leaving peripheral regions of numerous heritage sites trapped in stagnant underdeveloped conditions.

In the new era, the conservation and utilization of large archaeological sites is undergoing profound transformations: shifting from archaeological archiving to academic interpretation, from passive protective intervention to cultural inheritance, and from cultural-tourism integration to public shared development. Instead of merely guaranteeing the physical integrity of cultural relics, revitalization and utilization target to build a symbiotic system integrating cultural lineage inheritance, ecological security and social welfare. As an interdisciplinary discipline synthesizing landscape ecology, architectural construction and social space research, environmental design provides cross-field intervention methods throughout this transformation. Beyond superficial formal optimization of physical spaces, environmental design involves spatial transcription of historical information, redefinition of genius loci and spatial reconstruction of social relations.

Within large archaeological site zones intertwined with diversified stakeholder interests, resolving the structural contradiction between "development restricted by conservation" and "conservation undermined by overdevelopment" via design intervention has become a key concern for academic communities and industrial practitioners. This paper systematically reviews existing theoretical frameworks, elaborates multi-dimensional intervention pathways of environmental design targeting large archaeological sites, and dissects institutional obstacles and design misconceptions emerging from real-world revitalization practices. It further reveals spatial governance logic underlying large-site revitalization, so as to provide theoretical references and practical strategies for sustainable conservation of China's large archaeological sites and coordinated high-quality development of urban and rural spaces.

2. Theoretical paradigms for the revitalization of large archaeological sites

The revitalization and utilization of large archaeological sites constitutes a systematic project exceeding simple relic restoration, whose essence lies in inheriting historical cultural values for contemporary society and reconstructing social spatial relations. Abandoning the traditional view that labels large archaeological sites as static ruins, contemporary academia and industrial practitioners have established multi-dimensional theoretical paradigms covering cultural attributes, social ethics and geographical spaces. These paradigms answer the ontological question of "*Why large archaeological sites need revitalization*" from varied dimensions and set core guiding principles for subsequent environmental design interventions.

2.1. Concept of value continuity and living heritage conservation

Functioning as the gene pool of Chinese civilization, the core of large-site revitalization lies in constructing a targeted value interpretation system. Centered on continuous value inheritance, modern conservation philosophy stresses that heritage protection shall never sever historical context but generate integrated revitalization routes for harmonious coexistence [1]. The living heritage conservation theory opposes confining large archaeological sites to policy-frozen time fragments or closed museum exhibits. Particularly for rural-type large archaeological sites, the inheritance of traditional culture must follow living conservation principles: under rigorous preservation requirements, outstanding traditional cultural values fuel endogenous progressive development of local villages and evolve along the continuation of historical context [2]. Guided by such philosophy, environmental design interventions shall respect the life cycle of heritage sites and

implant modern production and living functions into peripheral zones with appropriate scale, facilitating cross-temporal communication between historical relics and contemporary daily life.

2.2. Logic of spatial justice and social symbiosis

Large archaeological site zones always witness intense conflicts between stringent cultural relic protection regulations and indigenous residents' development demands. Restrictive zoning control within protected areas including height limits and construction bans results in underdeveloped public infrastructure and suppressed developmental opportunities for local inhabitants, triggering spatial injustice [3]. To break the traditional zero-sum game between heritage conservation and regional development, introducing social symbiosis logic becomes essential for fostering benign interactive relations. Within the framework of the *Rural Revitalization Strategy*, large-site preservation must coordinate thoroughly with local socioeconomic advancement. Specifically, relevant policies shall enhance the resilience of heritage communities, motivate villagers to participate in site conservation and industrial development, and construct a multi-governance community featuring government leadership, technological empowerment, market coordination and public participation. Such a development model with shared interests and joint accountability among all stakeholders constitutes a fundamental ethical and theoretical foundation for reciprocal coexistence between heritage preservation and residents' wellbeing, as well as resolving livelihood conflicts and optimizing spatial governance of site settlements.

2.3. Genius loci and the production of space theory

Derived from Henri Lefebvre's production of space theory, large archaeological sites transcend mere physical ruins and evolve into complex cultural spaces constructed by diversified social relations. The genius loci theory highlights public perception of accumulated history and cultural identity embedded in specific sites. Existing research verifies that environmental design-based spatial production facilitates in-depth integration between characteristic cultural spaces of large archaeological sites and clustered cultural industrial spaces [4]. From a macro watershed and regional perspective, cultural spaces of large archaeological sites present a networked layout characterized by central agglomeration and peripheral diffusion, laying solid geographical foundations for cross-regional physical space infilling, resource integration and holistic landscape renovation.

In summary, living heritage conservation guarantees continuous cultural lineage, social symbiosis safeguards indigenous residents' spatial rights, and the production of space theory supports industrial upgrading. Complementing each other, these three theoretical paradigms form the theoretical foundation for large-site revitalization and guide environmental design to transcend superficial landscape construction and coordinate the compound relations among cultural inheritance, social equity and regional economic development.

3. Multidimensional intervention paths of environmental design for large archaeological sites

Guided by aforementioned multi-disciplinary theories, environmental design converts underground or fragmented above-ground cultural heritage resources into visible, accessible and experiential modern spaces through systematic spatial planning, landscape construction and technical empowerment. These intervention routes address the methodological question of "*How to revitalize large archaeological sites*", covering comprehensive design strategies ranging from macro regional coordination to human-scale micro-space renovation and from physical reconstruction to virtual digital expansion.

3.1. Landscape integration and feature remodeling model

National Archaeological Site Parks represent the most mature and prevailing landscape integration and revitalization mode for China's large archaeological sites. By demarcating core protected zones, exhibition areas and service zones, such parks integrate multiple functions including heritage conservation, public education, cultural display and tourism service to realize systematic consolidation and comprehensive utilization of site values. Meanwhile, as core conservation ideas shift from relic-centered to human-oriented management, interactions between site exhibition and public experience turn into a vital evaluation indicator for *National Archaeological Site Park* construction. Beyond spatial display of relics, environmental design undertakes responsibilities of cultural interpretation, public cognition cultivation and cultural memory inheritance [5]. Serving as spatial translators, designers transform abstract archaeological findings into tangible cultural landscapes via holistic scenic remodeling. Practical cases validate such application: diversified display approaches including in-situ preservation, ground marking, vegetative symbolic representation and partial overburden exposure are adopted in Luoyang's large archaeological sites, converting static ruins into urban cultural landscape parks open to the public [6]. During the construction of the *Central Capital of the Yuan Dynasty National Archaeological Site Park*, environmental design highlights original city wall remains and central axis layout; orderly landscape sequences reinforce the grand historical narration and desolate historical atmosphere of the Mongol-Yuan imperial capital, turning the heritage into a landmark urban cultural calling card [7].

Targeted customized design strategies are formulated for differentiated heritage categories. For Paleolithic sites with limited ornamental value such as the Paleolithic site cluster in Luonan Basin, design priorities focus on ecological restoration and immersive landscape construction simulating primitive human survival scenarios [8]. Prehistoric settlement sites distributed in Chifeng, Inner Mongolia emphasize holistic coordination between relic remains and vast surrounding natural landscapes in conservation planning [9]. For handicraft heritage sites like the *Tianmu Kiln Site Cluster*, designers extract localized landscape symbols inherited from ancient kiln villages to renovate surrounding environments, integrating ancient craftsmanship culture with contemporary cultural tourism landscapes [10]. To tackle prevalent idle land and spatial fragmentation arising from heritage protection restrictions, environmental design evolves from conventional landscape shaping toward adaptive reuse of reserved spaces. Restricted construction policies lead to long-term inefficient or vacant land within the Chang'an City of the Western Han Dynasty site zone. To mitigate conflicts between conservation and development, designers introduce temporary landscape interventions on idle land by applying reversible facilities, ecologically restored green spaces, seasonal activity venues and participatory public space construction to progressively renew marginal site areas, activating underutilized spaces and stimulating endogenous regional vitality [11]. Such low-intervention and flexible landscape renewal minimizes disturbance risks to core relics and reserves reserved spaces for future functional implantation and community participation.

3.2. Urban-rural symbiosis and settlement infilling model

Numerous large archaeological sites across China such as the *Liangzhu Ancient City Ruins* and *Western Han Chang'an City Ruins* spatially overlap with contemporary villages and farmland. Faced with complicated human-land relationships, environmental design adopts urban-rural symbiosis and settlement infilling as core strategies to reconcile conflicts between conservation and socioeconomic development. In Liangzhu Site practice, coordinated planning covering core heritage zones and peripheral villages creates brand-new industrial opportunities for rural communities relying on site exhibition systems and forms mutually beneficial symbiotic development [12].

Within *Western Han Chang'an City Site Zone*, stringent conservation regulations trigger village hollowing and abandoned spaces; accordingly, environmental design implements acupuncture-style micro-renewal targeting idle homesteads and derelict public land. Designers recycle local construction materials and build vernacular landscapes to introduce environmentally compatible industries including cultural creativity and research-tourism programs [13]. Centered on settlement spatial governance, this development path resolves interest disputes over large-site development [14], improves residents' living standards and converts rural settlements into extended carriers of living cultural heritage and clustered cultural industries. Similar practices are observed at the *Nianzipo Site* and *Liya Site*: aligned with the *Rural Revitalization Strategy*, designers plan integrated agriculture-culture-tourism spatial carriers, upgrade public service infrastructure and explore local cultural resources to synchronize heritage protection and regional advancement. The *Liya Site* project proves that heritage preservation can act as a robust engine boosting local social and economic development [15, 16]. Deep integration between heritage resources and rural industrial chains strengthens regional cultural identity and injects new momentum into local economic growth and grassroots governance.

3.3. Digital transcription and Metaverse empowerment model

Digital transcription and Metaverse-enabled development emerge as cutting-edge revolutionary environmental design routes to maximize cultural presentation under the minimum-intervention principle that forbids underground relic excavation damage. Constrained by geographical limits, time barriers and traditional technical restrictions, conventional site display is substantially improved by immersive real-time interactive features brought by Metaverse technology [17].

Relying on Digital Twin technology and spatial information platforms, environmental designers connect scattered standalone heritage resources into networked industrial clusters. Digitized archaeological archives, informatized cultural relic data and standardized database platforms lay foundations for innovative virtual-real integrated development: Augmented Reality (AR) and Mixed Reality (MR) technologies embedded within physical archaeological parks deliver immersive Metaverse experience; Metaverse-powered intelligent navigation and historical scene restoration allow visitors to visualize vanished grand ancient palaces above existing ruined foundations. Such interconnected virtual-physical development enriches multi-dimensional site narration and facilitates visualized coordinated exhibition of cross-regional large-site cultural networks represented by heritage clusters alongside the *Yellow River Basin* [18]. Digital platforms further connect heritage sites, cultural facilities, tourist nodes and community spaces to build coordinated industrial and value chains, upgrading large archaeological sites from isolated cultural resources to compound cultural industrial systems [19].

To summarize, landscape integration remodels physical forms and ecological frameworks of heritage sites; urban-rural symbiosis links heritage preservation with local social development; digital transcription and Metaverse empowerment break physical spatial limitations. Interconnected three approaches constitute the core methodological system of environmental design for large-site revitalization and promote organic integration between grand historical narratives and contemporary urban-rural developmental demands.

4. Review of revitalization outcomes and underlying practical dilemmas

Despite remarkable progress achieved in *National Archaeological Site Park* construction and cultural-tourism integration via environmental design intervention, macroscopic territorial spatial governance and microscopic benefit distribution analysis reveal deep-rooted practical dilemmas originating from conflicting policies, capital operations and cognitive deviations in real-world implementation.

4.1. Restricted evaluation mechanism and ambiguous boundary of design intervention

Large-site revitalization constitutes a sophisticated compound system incorporating multiple influential factors, yet standardized quantitative universal evaluation systems assessing coordination between cultural spaces and clustered cultural industrial spaces remain absent nationwide. Lacking unified evaluation benchmarks, design institutes and administrative authorities struggle to strike a balanced relationship between heritage protection and development during conservation planning formulation and implementation, generating severe contradictions between preservation requirements and local land resource allocation. Pursuing instant spectacular visual effects or catering to commercial tourism demands blurs design intervention boundaries in certain projects, triggering constructive damage such as excessive hard paving and over-construction against the intrinsic fragmented ruins feature and holistic conservation principles [19]. Even finished *National Archaeological Site Parks* including the *Central Capital of the Yuan Dynasty Site* suffer from monotonous exhibition forms, insufficient follow-up revitalization approaches and poorly enforced planning zoning boundaries.

4.2. Homogenized narrative and superficial spatial transcription

The nationwide upsurge of large-site revitalization leads to hasty copycat development and homogenized cultural narration in environmental design practices. Especially for prehistoric Paleolithic and early settlement sites lacking above-ground architectural remnants with low readable historical information, most design schemes remain confined to pseudo-ancient architecture construction and formulaic marker layout without in-depth excavation of unique site connotations and historical values. Spatial construction frequently copies stereotyped traditional architectural forms or mechanically extracts symbolic roof elements, resulting in superficial cultural transcription detached from authentic historical contexts. Site exhibition shall balance factual historical information and authentic public experience [20]; however, such superficial design fails to establish systematic interpretation frameworks based on core site values, distorting distinctive genius loci and undermining regional cultural identity.

4.3. Scale distortion and bonsai-style development lacking daily life functions

Some large-site exhibition projects prioritize spectacular grand-scale planning and cause severe spatial imbalance between physical constructed landscapes and original social spaces. Massive land acquisition and village relocation are executed to form continuous visually unified exhibition zones, replacing indigenous traditional settlements and original living environments with artificially planted landscapes. Space reconstruction oriented merely toward sightseeing severs long-standing historical ties linking heritage sites with surrounding natural surroundings and indigenous communities, decoupling relics from their original socioeconomic and cultural contexts.

Eliminating indigenous daily practices and folk activities from site spaces gradually erodes embedded social memories and residential functions. Although neat unified landscapes are formed within exhibition zones, insufficient continuous resident participation and daily social vitality lead to underutilized land and lifeless heritage spaces. Ultimately, large archaeological sites evolve into static ornamental scenic spots exclusively for short-term tourist visits, presenting typical bonsai-style development characteristics. Centered on physical relic preservation while ignoring resident participation and continuous cultural inheritance, such spatial governance deviates fundamentally from living conservation and sustainable development philosophies of cultural heritage.

4.4. Imbalanced benefit distribution and institutional constraints of administrative management

Space revitalization and environmental renovation within large-site zones essentially involve complicated power restructuring and capital gaming processes. China's current fragmented administrative system assigns large-site management across cultural relic, natural resource, environmental protection and cultural tourism authorities; cross-departmental segmentation hinders coordinated policy implementation and triggers frequent administrative prevarication and practical conflicts. Dominated by spatial governance and tourism capital operation rules, indigenous residents as core stakeholders hold insufficient discourse power and participation channels, facing potential deprivation of land development rights and economic benefits. Additionally, rigid territorial spatial planning indicators and chronic shortage of sustainable conservation funds hinder in-depth benefit coordination and high-efficiency factor aggregation for large-site cultural industrial development.

In conclusion, China's large-site revitalization is plagued by interwoven obstacles covering incomplete spatial coupling evaluation, superficial cultural transcription, vanished daily living functions and fragmented administrative management. It proves that environmental design for large archaeological sites cannot limit itself to physical aesthetic optimization, but requires interdisciplinary insights to reconcile complicated social structural evolution and benefit allocation conflicts hidden behind spatial forms.

5. Conclusion and prospect

Large archaeological site conservation and revitalization constitutes a long-term sophisticated systematic project spanning historical inheritance and future development balancing material preservation and spiritual heritage. At the historical intersection of new-type urbanization and the P*owerful Cultural Country Strategy*, breakthroughs breaking institutional shackles are required in both theoretical research and practical planning to explore inclusive sustainable development modes. Systematic literature review in this paper indicates that China's large-site revitalization philosophy has upgraded from isolated static relic preservation to compound development integrating spatial justice, living inheritance and production of space theories. As core intervention approaches, landscape integration, urban-rural symbiosis and digital technology empowerment inject contemporary vitality into abandoned heritage and restructure local human-land relations via environmental design. Nevertheless, existing revitalization practices are trapped in persistent bottlenecks including ambiguous design boundaries, homogenized cultural narration, deficient daily living experience and inequitable benefit allocation. Breaking such predicaments demands escaping narrow physical environmental design limitations and returning to the inherent civilizational essence and collaborative social attributes of cultural heritage.

Looking ahead, holistic systematic thinking shall dominate future large-site revitalization practices. At the macro policy and spatial management level, large-site conservation planning shall integrate seamlessly into national territorial spatial planning under unified spatial management maps; relying on spatial information platforms, rigid preservation redlines and flexible development spaces are scientifically designated to coordinate heritage protection, spatial governance and regional socioeconomic advancement [21]. At the technical innovation level, driven by digital economy, innovative virtual-real interactive development expands digital presentation boundaries of the *Chinese Civilization Origin Project* and realizes value co-sharing between large-site revitalization and global diversified users. At the social governance level, institutionalized humanism-oriented community co-construction mechanisms shall grant development rights to indigenous residents and introduce diversified market investors, facilitating harmonious win-win progress between large-site cultural space construction and high-quality contemporary urban-rural development, so as to sustain everlasting vitality of large archaeological sites amid the great rejuvenation of the Chinese nation.

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