

A Study on the Synergistic Mechanism between Urban Renewal and Cultural Heritage Conservation from the Perspective of Adaptive Governance: A Case Study of Hechai 1972 in Hefei

Duoyang Tu*

Anhui University of Finance and Economics, Bengbu, Anhui, China

*Corresponding Author: Duoyang Tu

ABSTRACT

Abstract: In the context of urban renewal shifting from "incremental expansion" to "quality improvement of existing assets", based on the theory of adaptive governance, an analytical framework of "value coupling - subject integration - rule adjustment - resilience feedback" was constructed. Taking the Hefei Hechai 1972 Cultural Park as a sample, the collaborative mechanism for the protection and renewal of cultural heritage was explored. The study found that although Hechai 1972 had formed some initial experiences such as minimal intervention of relics and dynamic implantation of functions, there were still obstacles such as shallow protection of intangible industrial culture, imbalance between commercialization and authenticity under capital-driven circumstances, suspended cross-ownership institutional supply, and absence of spatial resilience feedback. Based on this, an optimized path of tripartite narrative of material, intangible, and memory, multi-party co-governance contract, dynamic rule supply, and digital twin empowerment for co-governance was proposed. This provides a transferable practical model for similar industrial heritage to "develop while protecting".

KEYWORDS

Urban Renewal; Cultural Heritage Protection; Adaptive Governance; Hechai 1972.

1. THE PROPOSAL OF THE ISSUE

Entering the new stage of China's modernization, the logic of urban development has shifted from "incremental expansion" to "quality improvement of existing resources". Urban renewal and cultural heritage protection have been simultaneously elevated to the national strategic level. The report of the 20th National Congress of the Communist Party of China clearly deployed "implement the urban renewal action, strengthen urban infrastructure construction, and create livable, resilient, and smart cities", and at the same time emphasized "increase the protection of cultural relics and cultural heritage, strengthen the protection and inheritance of historical culture in urban construction, and build and utilize national cultural parks well", integrating both into the systematic framework for promoting cultural confidence and strength, and creating a new brilliance of socialist culture [1]. The 4th Plenary Session of the 20th Central Committee of the Communist Party of China further pushed urban work to the dimension of "intensive development", proposing "persist in intensive development of cities, vigorously implement urban renewal, and build modern people's cities that are innovative, livable, beautiful, resilient, civilized, and smart"; in the cultural dimension, it requires "promote systematic protection and unified supervision and inspection of cultural heritage, and strengthen effective protection and dynamic inheritance of historical cities, districts, and villages" [2]. It is

necessary to "handle the relationship between urban renovation and development and the protection and utilization of historical cultural heritage, and truly achieve development while protecting, and protection while developing"; planning and construction should "not be overly ambitious and should not involve large-scale demolition and reconstruction", and should adopt micro-renovation, which is like "embroidery work", "respect and treat the old buildings in the city like an 'old person'", and make the heritage displayed on the vast land "come alive". These series of statements have established the fundamental principles of "prioritizing protection, dynamic inheritance, and people-oriented cities", and also reveal that urban renewal is not merely the reshaping of physical space, but a systematic reproduction of cultural value, social memory and governance capabilities [3].

However, at the practical level, there is still a significant tension between the policy vision and the actual implementation. Firstly, the path dependence driven by development has not been fundamentally reversed. Some cities still follow the "rebuild from scratch" logic of real estate development, prioritizing economic returns while neglecting the continuation of the cultural context, resulting in "identical cities", the loss of authenticity, and constructive destruction. Secondly, protection and innovation are often treated as two separate and opposing elements - one end is "freeze-style protection" that turns the heritage into idle exhibits, while the other end is excessive commercialization that alienates historical districts into homogeneous "hotspots for photo-taking", causing the rupture of cultural memory and the loss of the original residents. Thirdly, the governance entities are single, and the allocation of rights and responsibilities is imbalanced. The permits for the restoration of historical buildings are complicated, and social capital is hesitant due to the complex property rights and uncertain returns, making it difficult to form an institutionalized and replicable promotion mechanism. Fourthly, new objects such as industrial heritage and site textures lack detailed identification standards and full-process supervision. The scale of renovation, modification, or demolition is often determined by the project unit itself, and the institutional supply is significantly lagging behind the update practice. Additionally, existing academic research mostly unfolds along the debate between "protectionists" and "developers", lacking theoretical responses to the collaborative mechanisms in dynamic, complex, and multi-party scenarios.

The Hefei Hechai 1972 Cultural and Creative Park is composed of the former Hefei Diesel Engine Factory, Hefei Prison and other industrial and special-function sites. Since 2019, it has started the renovation project under the model of "industrial heritage protection + cultural creativity", preserving iconic remnants such as the dome workshop, guard tower, and chimney, and integrating contemporary art and public functions. It has become a typical sample of the transformation of existing industrial land. By taking this as a starting point to examine the collaborative dilemma and possible paths of urban renewal and cultural heritage protection, it not only responds to national strategic requirements but also provides transferable institutional inspirations for similar industrial heritage-type renovations.

2. ADAPTIVE GOVERNANCE: THE COLLABORATIVE MECHANISM FOR URBAN RENEWAL AND CULTURAL HERITAGE PROTECTION

2.1 Theoretical Foundation: The Historical Trace and Core Principles of Adaptive Governance

The concept of "adaptive governance" was first systematically proposed by Dietz, Ostrom, and Stern in their article "The Struggle to Govern the Commons" published in *Science*, aiming to address the dilemma of "fixed rules inevitably failing" in the governance of common pool resources. It advocates that the design of the system should reserve space for evolution to cope with the non-linear changes in the social-ecological system. In terms of its core essence, adaptive governance encompasses four propositions: First, contextual constraint - the uncertainty and complexity of the social-ecological system directly determine that action choices must "traverse the river by feeling the stones"; second, rule flexibility - governance rules must be dynamically iterated in accordance with ecological

thresholds, technical conditions, and social demands, and reject one-size-fits-all control; third, multi-party collaboration - heterogeneous entities such as the government, market, community, and experts continuously interact through cross-scale linkage networks to replace the hierarchical single-core logic [4]; fourth, social learning loop - through continuous experiments of monitoring, feedback, and correction, the efficiency of institutional reproduction is achieved [5]. Qin Fang further compared it with the traditional "top-down static management" in the research on traditional village governance, highlighting its "dynamic, systematic, and learning by doing" paradigm characteristics [6]. After being introduced into the Chinese context, this theory underwent local reconstruction. The Western prototype, with local autonomy as the core, has tension with China's central-local relationship and the "government responsibility - social collaboration" model [7]. Han Boting proposed the "graded trial system", and Wang Shaoguang refined the "policy pilot - learning adaptation" model. Together, they pointed out that the key to China's adaptive governance lies not in the structure but in the autonomy of the government, manifested as local governments making "appropriate" adaptations to policies based on central authorization [8]. Thus, adaptive governance has completed the paradigm shift from ecological resource management to complex fields such as urban renewal, heritage protection, and grassroots governance, providing a direct theoretical source for this study.

2.2 Analytical Framework: The Synergistic Mechanism of Urban Renewal and Cultural Heritage Protection

The practical tension between urban renewal and cultural heritage protection is essentially a structural mismatch between the static protection logic and the dynamic development demands. The solution cannot stop at the simple choice of "protection" or "demolition", but needs to introduce the perspective of adaptive governance and construct a collaborative analysis framework that accommodates uncertainty and supports continuous learning. Firstly, it is based on the deep coupling of value contexts: historical and cultural districts and industrial heritage are not isolated material specimens, but a dynamic system "material remains - social memory - community life - urban functions" intertwined [9], and within it, there are symbiotic relationships between material carriers and skill practices, spatial texture and collective emotions [10]. Therefore, the logical starting point of collaboration is to transcend the thinking of "individual relics", transforming the heritage site from a passive renewal object into a "priority protection, reuse for use" composite value unit, and completing the identification of the context within the overall framework of integrated urban and rural development and improvement of people's livelihood. On this basis, the collaborative mechanism unfolds along three lines. The first is the integration mechanism of multiple entities. In response to the "government doing, the public watching" or market profit-driven alienation caused by traditional hierarchical single-core governance, it is necessary to rely on the "inclusion - integration - adjustment" action trajectory led by Party building, build a cross-scale linkage network of the government, operation entities, and local knowledge holders, and through flexible methods such as "one matter one discussion" consultation and community deliberation embedding, transform scattered interests demands into executable common governance contracts. The second is the dynamic adjustment mechanism of the rule system. Rejecting the "all-encompassing" control indicators that fit the living heritage, instead adopting "micro renovation" and "patchwork renewal" strategies, establish feedback channels for trial and error in the scale of leaving, renovating, and demolishing, the admission of business models, fire safety regulations, and exhibition functions [11], and connect fragmented remnants with "spatial narrative" to complete the cultural translation of industrial memories from sealed exhibits to contemporary public life [12]. The third is the feedback mechanism. The final outcome of the collaborative effect must return to the coupling coordination test of the "cultural - economic" dual resilience of the heritage site: from heritage identification, functional implantation, community participation to benefit feedback, forming a self-enhancing path of "protective development - value realization - feedback protection" [13].

In conclusion, the collaborative framework of "value coupling - entity integration - rule adjustment - resilience feedback" constructed in this study breaks away from the binary opposition of urban renewal and heritage protection, providing an operational analytical path for the revitalization of industrial heritage in the existing context.

3. CASE ANALYSIS: THE PRACTICAL EXPLORATION OF HEFEI HECAI 1972

3.1 Case Overview

Hecai 1972 Cultural Park is located at the intersection of Jinzhai Road and Hecai 1972 Cultural Park is located at the intersection of Jinzhai Road and Tianfangzhai Road in Baohai District, Hefei City. It is situated at the junction of Baohai, Government Affairs, and Shushan districts. The total planned area is approximately 1.5 million square meters, with the initial area being 287,000 square meters. The spatial evolution reflects the typical fate of industrial land in small cities of the People's Republic of China: starting in 1954 as Feixi Newborn Kiln Factory, renamed as Hefei Brick and Tile Factory in 1957, merged into Baihu Repair Factory in 1972 and named Hefei Diesel Engine Factory, overall converted into Anhui Provincial Hefei Prison in 1996, and after the prison relocated to Changfeng in 2018, the land was left idle. In the same year, the Hefei Municipal Government and Anhui Provincial Prison Administration jointly planned and the Binhu Investment Holding Group took over for restoration and operation. The park officially opened in October 2019, becoming the first in China to transform an "industrial building + prison site" into an open cultural park [14]. The overall practical logic can be summarized into four interwoven main lines. The first is the priority of preservation with minimal intervention logic. The factory retains the original factory grid roads, three fences, watchtowers, chimneys, large-span unreinforced brick domes, etc. Structural reinforcement adopts ultrasonic detection+carbon fiber cloth bonding, external steel-concrete combination method and aging treatment. Red bricks are replicated according to the original specifications of the kiln factory. Large-scale demolition and reconstruction are avoided [15]. The second is the logic of functional integration and dynamic implantation. The casting workshop is transformed into an electric appliance museum and contemporary art gallery, the fuel round tower is operated by Sanjie Art as a cultural experience store, the assembly workshop is connected by a glass corridor to form a coffee space, the equipment room and finished goods warehouse are transformed into a food cluster and film studio, and at the same time, the neighborhood center, public cafeteria and the 15th Li River waterfront ecological restoration belt are supplemented to form a "venue + affiliated commercial + independent commercial" dual business model. The third is the logic of flexible integration of multiple entities. The government, property owner, state-owned enterprise operation, social capital, former factory workers and surrounding communities form a cross-scale linkage network. Through "one matter, one discussion" consultation and space sovereignty bidding, the capital secondary circulation and public memory preservation achieve a tension balance [16]. The fourth is the logic of cultural translation and place spirit re-creation. The "time axis" is used to replicate the 70-year factory history, the old warehouse is directly curated, industrial vocabulary and contemporary art are juxtaposed, and Arc GIS historical plane restoration and VR/AR scene simulation are introduced to enhance public participation, avoiding the "frozen protection" trap [17]. These logics jointly point to the collaborative mechanism of "context coupling - entity integration - rule adjustment - resilience feedback" emphasized by adaptive governance, transforming Hecai 1972 from an abandoned industrial space - a punitive space into an iterative and learnable urban cultural node.

3.2 Practical Obstacles

3.2.1 The Superficial Protection of Non-material Industrial Cultural Carriers

The core value of industrial heritage should consist of "physical carriers - intangible skills - collective memory". Although Cheji 1972 retains the prominent physical markers such as red brick domes, watchtowers, chimneys and prison walls at the material level, it has fallen into the misconception of "emphasizing the physical aspect while neglecting the spirit". During the renewal process, non-heritage carriers such as diesel engine casting techniques, brick and tile firing processes, and the unique production organization logic and life discipline during the labor reform period were not systematically included in the protection list. The mechanical parts of the old warehouse were only displayed statically, while the technical diagrams of the production line, the oral history of the artisans, and the archival documents of the factory area were not transformed into participatory dynamic exhibitions, resulting in the industrial memory remaining at the level of visual curiosity. Additionally, the factory area has undergone identity transformations from a kiln factory, brick and tile factory, diesel engine factory to a prison. However, the renewal strategy failed to extract a unified narrative thread and instead juxtaposed the strictness of the prison, the roughness of industrial style, and the theme pavilion of "Appliance Capital" as a consumption gimmick, creating a chaotic landscape of "symbolic collage". This narrative dislocation lacking historical depth and emotional logic leads to the dispersion of the place's spirit, making it difficult for tourists to establish a complete understanding of the evolution of industrial civilization in Hefei. It weakens the cultural thickness of the heritage site as a memory anchor of the city and also reveals the absence of identification in the "contextual value coupling" section of adaptive governance.

3.2.2 "Commercial-Cultural" Imbalance Driven by Capital

The revitalization of Houchi 1972 was deeply embedded in the spatial reproduction logic dominated by capital. In the game of spatial rights among local governments, property rights holders, state-owned enterprise operators, and merchants, the market-oriented demand of "cultural attraction and consumption monetization" gradually overshadowed the original authenticity preservation demands of industrial heritage. In the first phase of the park, it could still focus on the narrative core of art galleries, home appliance story museums, and time exhibition halls. After the expansion of the second phase, the proportion of leisure businesses such as dining, wedding photography, skate park, and pop-up retail continued to rise. The cultural content gradually became the visual background, while the industrial heritage became a "Check-in Location" in the era of traffic. The traffic benefits failed to be transformed into cultural deepening. The park exhibited a path dependence of "internet celebrity label attraction - rapid convergence of business models - tidal passenger flow during holidays", which precisely exposed the absence of capital balance mechanisms and dynamic business model admission rules in the adaptive governance framework [18].

3.2.3 Lagging Institutional Supply in Multi-dimensional Collaboration

The industrial heritage renewal project is inherently constrained by the dual obstacles of complex property rights and rigid usage regulations. The 1972 site of Hechai is located across the boundary between the provincial prison system and the municipal state-owned land. The path for land transformation, the determination of retention, renovation or demolition scale, the recognition of industrial intangible cultural heritage, and the distribution of special restoration subsidies have long lacked top-level detailed regulations. In practice, the project entities often make their own decisions through the "one matter, one discussion" approach, presenting a state of institutional suspension where "flexibility is abundant but regulation is insufficient". At the same time, the participatory co-governance that adaptive governance relies on has not been fully implemented: the retired workers from the original factory and the permanent residents in the area near the junction of the three districts are mostly in a passive position of "being notified after the scheme is announced", lacking the deliberation process embedded in the normal decision-making process. The deeper contradiction lies

in the mismatch of governance rhythm - the operators are relying on passenger flow big data to iterate business models, but key links such as the adjustment of the cultural protection red line, the adaptation of brick and wood structure fire protection, and the political and professional review of exhibition content still require single-line approval through multiple departments, and there is a lack of standardized authorization lists and joint review windows for cross-departmental dynamic consultations. This "market agile trial and error + administrative rigid approval" institutional friction has led to the inability of protection rules to promptly respond to new problems in practice, causing the core of adaptive governance to be stuck at the "last mile" of institutional supply.

3.2.4 Shortcomings in Space Capacity and Public Service Facilities

The site of Hechatai 1972 is located at the administrative intersection of Baohua, Government Affairs, and Shushan districts. The unique geographical location has led to blurred responsibilities for municipal coordination, resulting in the initial update only using a single-sided opening on the Jinzhai Road auxiliary road. The internal road network has not achieved separation of pedestrians and vehicles, and during peak holiday passenger flow, the entrances and exits are constantly congested. The long-standing unresolved issues of external construction waste storage and mobile vendors occupying the sidewalks also reflect the typical time lag in the "quick activation of the plot but slow follow-up of municipal services" during the existing building update. The internal space quality has shown a significant polarization trend: although the park introduced a mixed layout of functions, due to the long-term suspension of the second phase projects such as the youth shared living area, the actual vitality is highly concentrated in the neighborhood center and the performing arts slope, and the "accessibility dividend" has not been fully released. More reflective is the suspension of the dimension of smart governance - Arc GIS historical restoration, VR/AR scene simulation and other technical means have only been sporadically implemented in the form of festival activities, without establishing a regular platform for public opinion collection and behavior data analysis, resulting in the lack of reverse input of citizen perception data in the adjustment of space operation and maintenance. This combination of lagging hardware support, uneven soft services and absence of digital feedback makes it difficult for the park's public service supply to match the positioning expectations of the "life show belt".

4 PATH OPTIMIZATION: COLLABORATIVE DEVELOPMENT PATH FOR URBAN RENEWAL AND CULTURAL HERITAGE PROTECTION

4.1 Deepen "Value Coupling": Establish a Tripartite Narrative System for Industrial Heritage that Integrates Material, Intangible, and Memory Aspects

In response to the problem of "heavy objects but light spirit" and the diffuse spirit of the site in the case of Hecai 1972, the heritage site must be restored from the "collection of explicit markers" to a dynamic system interwoven with "material remains - craft practices - collective memory", transcending the "single artifact" mindset. First, establish an industrial intangible cultural heritage list system, including diesel engine casting techniques, brick and tile firing processes, and production organization logic during the labor reform period, and incorporate them as protection objects. Through oral history collection by artisans, digitization of production line technical diagrams, and curatorialization of factory archives and documents, transform "static displays" into participatory and dynamic exhibitions [19]; Second, refine a unified narrative thread, abandon the strict sense of the prison, the rough style of industrial production, and the collage-style consumption of the "home appliance capital" theme, and instead use the seven decades of identity overlap from "1954 kiln factory - 1972 diesel engine factory - 1996 prison - 2019 cultural park" as a timeline, and use spatial narration to connect fragmented remnants; Third, introduce a cultural memory reproduction mechanism to prevent the industrial vocabulary from becoming merely symbolic when juxtaposed with contemporary art, but instead to carry the true historical trajectory of Hefei's industrial

civilization. Thus, the coupling of contextual value can move from "identification deficiency" to "deep anchoring".

4.2 Strengthen "Mainstream Integration": Establish a Multi-dimensional Collaborative Contract Integrating Capital Checks and the Embedding of Indigenous People

After the expansion of Phase 2 of Hecai 1972, the proportion of catering and wedding photography increased, and authenticity gave way to attracting customers and realizing profits. The root cause lies in the lack of a balancing lever in the space reproduction dominated by capital. First, solidify the "government - property owner - state-owned enterprise operation - social capital - original factory workers - surrounding community" linkage network, elevate the original retired workers and residents of the three districts who are permanent residents from being notified after the scheme is publicized to having a permanent seat at the negotiation table, and rely on neighborhood deliberation halls and renewal cooperatives to achieve dual incentives of "shares + points"; second, set up a negative list for business types, implement a protective red line for narrative core elements such as art galleries, appliance story museums, and time exhibition halls, restrict the unlimited expansion of similar leisure business types such as flash retail and skate parks, so that "cultural innovation attraction" always serves "cultural deepening"; third, introduce the "one matter, one discussion" consultation model. In the factory area, form a "space sovereignty auction + public review board joint signature" to balance the secondary circulation of capital and the preservation of public memory. Ultimately, achieve "government doing, public viewing" or the transformation of market profit-driven alienation into a common governance contract.

4.3 Refining "Rule Adjustment": Through Systematic Protection System Provision to Bridge the "Last Mile"

Industrial heritage spans the provincial prison system and the municipal state-owned land ownership boundary. The "one matter, one discussion" style of discretionary power leads to "flexibility being abundant but regulations being insufficient". First, promote the implementation of upper-level detailed regulations - clarify the path for land transformation, the standards for determining the scale of retention, renovation, and demolition, the methods for recognizing industrial intangible cultural heritage, and the procedures for distributing special restoration subsidies, incorporating the minor adjustments to the cultural protection red line, the adaptation of brick and wood structure fire protection, and the review of exhibition content into the standardized authorization list; second, establish a cross-departmental joint review window, integrating the single-line reporting and approval of planning, tourism culture, and construction departments into "cultural heritage impact assessment for update projects + joint review opinion letter", responding to the requirement of "promoting systematic protection and unified supervision of cultural heritage", and drawing on the "Listing protection mechanism" of the Yangtze River National Cultural Park, implementing unified coding and Listing for landmark carriers such as the dome workshop, watchtower, and chimney of Hechai 1972, and implementing classified supervision; third, promote "micro-renovation" to be included in local regulations, establishing it as an independent update type in local urban renewal regulations; resolutely break away from the rigid requirements of unified control indicators, and instead, identify differences through urban health checks, correct rules through implementation feedback, and complete the gradual iterative process of the updated system in "small-scale trial and error - regular feedback - dynamic rule calibration".

4.4 Implement "Resilience Feedback": Digital Twin Enabling and Public Space Collaborative Governance

At present, Arc GIS restoration and VR/AR are merely decorative elements during the 1972 festival of Huizhai. The responsibility for municipal coordination at the intersection of the three districts is ambiguous, and there is no separation of internal vehicle and pedestrian traffic. The essence of this is the absence of the "space resilience feedback". On one hand, a district-level CIM+ digital twin base should be established to unify spatial coding for ancient trees, structures, business distribution, passenger flow heat maps, and brick and wood structure health monitoring, achieving a "identification - simulation - governance" closed loop, rather than merely for display [20]; simultaneously, a gamification interaction mechanism should be introduced to accumulate public behavior data through game-based solutions such as industrial memory puzzles and virtual factory renovations, effectively promoting timely adjustments to the operation and maintenance mechanism. On the other hand, to fill the gaps in hardware and governance, the municipal government at the prefectural level should take the lead in clarifying the municipal responsibility divisions for Baohai, government affairs, and Shushan districts, opening multiple entrances, configuring underground parking and bus connections, and including the unfinished second phase of the youth shared living area in the government's guaranteed list; in terms of soft services, relying on the continuous interaction of "public experience - market operation - government regulation", the accessibility benefits should be extended beyond the physical boundaries of the neighborhood center to promote the equitable and homogeneous benefits of public services. When digital feedback and the physical space iterate simultaneously, the social learning feedback mechanism of "monitoring - feedback - correction" for adaptive governance can truly be implemented.

5 CONCLUSION

Currently, the systematic protection of cultural heritage has been elevated to a national strategy. Taking the Hefei Hechatai 1972 Cultural Park as a typical case, this paper analyzes the internal mechanism of the coordinated advancement of industrial heritage protection and urban renewal. The research reveals that the essence of the practical tension between the two is not the binary opposition of "preservation and demolition", but the governance mismatch caused by the static hierarchical control logic being unable to adapt to the survival needs of dynamic heritage. The exploration of minimal intervention and functional patching at Hechatai 1972 verified the explanatory power of adaptive governance in the industrial heritage renewal field. The exposed phenomena such as fragmented intangible cultural narratives, capital market squeezing authenticity, suspended cross-ownership institutional supply, and delayed public feedback transmission also reflect the common bottlenecks faced by similar projects at present. The four-in-one optimization path proposed in this paper is the localized translation of adaptive governance theory in the context of "government-led - social collaboration" governance in China, and can provide transferable institutional references for the renewal of existing industrial land. It also echoes the policy orientation of "development while protecting". In the future, with the improvement of the supervision mechanism for systematic protection of cultural heritage and the penetration of digital technology, it is expected that a governance paradigm that takes into account the continuity of the cultural context, the improvement of people's livelihood, and the enhancement of spatial efficiency will gradually form in the renewal field of existing industrial land.

CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest.

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