

Article

The Changing Policy Agenda of Industrial Heritage Governance in Shanghai, 2006–2025: Land Use, Adaptive Reuse and Urban Regeneration

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Abstract

In the context of urban regeneration and the redevelopment of existing urban land and built assets, industrial heritage has become a cross-sectoral policy issue involving heritage conservation, spatial reuse, land governance and public cultural uses. Existing studies have primarily examined individual adaptive reuse projects and spatial strategies, whereas the long-term evolution of policy texts has received less systematic attention. Taking Shanghai as a case study, this paper constructs a clause-level corpus of industrial heritage-related policies issued between 2006 and 2025. The corpus comprises 524 clauses extracted from 86 policy documents covering heritage conservation, historic building conservation, cultural and creative industries, land use, planning, urban renewal and industrial tourism. Overall and stage-based Latent Dirichlet Allocation (LDA) models are combined with cross-period topic alignment to identify the structure and evolution of policy themes. The results show that Shanghai's industrial heritage policies have been shaped not only by heritage conservation concerns, but also by industrial land governance, the transformation of underused industrial land, the regeneration of existing industrial spaces (EIS), industrial culture, tourism and public service provision. Four stages are identified: initial exploration, regulatory consolidation, revitalisation and renewal, and integrated consolidation. Across these stages, four major evolutionary pathways can be observed: industrial land supply and governance, renewal of EIS and old industrial areas (OIA), industrial heritage conservation and value recognition and the expansion of industrial culture, tourism and public services. The paper provides clause-level evidence for understanding industrial heritage governance in China's urban regeneration context and highlights the need for stronger coordination between heritage, land, planning, industry, culture and tourism policies.

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1. Introduction

Industrial heritage is an important material record of urban industrialisation, embodying production technologies, spatial organisation, industrial memory and collective identity. *The Nizhny Tagil Charter* and *the Dublin Principles* define industrial heritage broadly, covering not only buildings and machinery, but also sites, structures, areas, landscapes, infrastructures and related documentary or social evidence associated with industrial production [1,2]. Compared with ordinary historic buildings, industrial heritage is often embedded in large-scale and multifunctional spaces, including factories, warehouses, docks, industrial parks and old industrial districts. Its conservation and reuse, therefore, extend beyond the repair of physical fabric, involving land reallocation, industrial restructuring, changes in land use and spatial use, and urban regeneration [3–5].

Internationally, the conservation of industrial heritage has increasingly moved beyond the preservation of isolated monuments or technical artefacts [4,6]. It is now widely discussed in relation to adaptive reuse, brownfield regeneration, planning control, interpretation, public access and the reuse of former industrial areas. This shift reflects a broader understanding that industrial heritage is not only a material remnant of production, but also a spatial, social and economic resource that can support urban regeneration and place-based development [7–9]. However, the ways in which this transformation is governed vary across institutional contexts. In many cases, the reuse of industrial heritage depends on land ownership, development rights, planning regulation, investment arrangements and coordination across heritage, cultural, economic and spatial policies [3,4].

Within this broader international shift, China provides a distinctive institutional context. Industrial heritage conservation and reuse are strongly shaped by government-led land institutions, planning regulations and industrial policies. Relevant policy instruments involve cultural heritage and historic building conservation, industrial heritage value recognition, land use conversion, development intensity control, the introduction of industries, park renewal, and the organisation of urban regeneration projects [3,5]. As a result, whether industrial heritage is treated as a cultural object requiring conservation, an existing industrial asset available for reuse or a strategic resource for regeneration often depends on changing policy agendas, policy instruments and governance arrangements.

Shanghai was among the first Chinese cities to experiment with the conservation and reuse of industrial heritage [10]. With the relocation of industrial functions and the regeneration of inner-city areas, Shanghai has accumulated diverse industrial heritage resources and practical experience in the reuse of old factories, creative industry clusters, waterfront industrial regeneration, and public cultural use [11]. Since the mid-2000s, creative industry clusters based on old factory buildings have become an important mechanism for reusing industrial spaces in Shanghai, accompanied by continuous adjustments in land use, planning, industrial and conservation policies [11–16]. These conditions make Shanghai a representative case for examining how industrial heritage governance has evolved within China's broader transition towards urban regeneration and the redevelopment of existing urban land and built assets [17].

Existing studies have provided valuable insights into industrial heritage value identification, adaptive reuse, creative industry development and urban regeneration. International research has shifted from conservation principles to the reinterpretation of industrial heritage through new functions, public access, cultural activities and place-based regeneration [2,9]. In China, the reuse of industrial heritage is more closely connected with land redevelopment, industrial upgrading, and state-led urban regeneration [6,18]. Studies have shown that industrial heritage conservation is often embedded in local development strategies and spatial governance, with local governments playing a central role in selecting, regulating and mobilising industrial heritage resources [5,19–21]. However,

most existing studies still focus on project-based practices and spatial strategies, whereas the policy system itself and its long-term evolution remain insufficiently examined.

The gap is particularly important in Shanghai because industrial heritage-related provisions are widely embedded in policies concerning heritage conservation, historic building conservation, cultural and creative industries, land use, planning implementation, urban renewal, industrial tourism and public service provision [3,22–24]. Therefore, a document-level review of explicit industrial heritage policies is insufficient. It is necessary to examine policy clauses across multiple policy fields in order to understand how industrial heritage has gradually been reframed from reusable industrial space into a cross-sectoral policy issue involving the governance of conservation, reuse, and regeneration [25,26].

To address this embeddedness, this study combines clause-level policy text analysis with topic modelling. Policy clauses are treated as the basic analytical units because they can capture specific institutional preferences, implementation requirements and policy instruments [27]. Latent Dirichlet Allocation (LDA) is used to identify latent themes in the corpus by representing each clause as a mixture of topics and each topic as a probability distribution of words [28,29]. This approach makes it possible to identify policy agendas, compare thematic differences across periods and trace shifts in governance priorities [30,31]. At the same time, topic numbers, topic labels and semantic interpretations need to be calibrated through policy context, representative clauses and domain knowledge [32].

Beyond identifying textual themes, this study interprets Shanghai's industrial heritage policy evolution through the lens of policy translation across scales. Studies on policy mobility and scale politics suggest that policies are not simply transferred as fixed models; rather, they are reinterpreted, selected and recombined through specific institutional settings, administrative capacities and development priorities [33–35]. This perspective is particularly useful for analysing industrial heritage governance in China. National frameworks define broad policy objectives and provide institutional legitimacy, while municipal governments translate them into operational tools through land-use regulation, urban renewal programmes, industrial restructuring, cultural policy and heritage management. In this sense, Shanghai's industrial heritage policy agenda is examined not only as a set of textual themes but also as a cross-scale governance process in which national policy guidance and municipal implementation instruments are selectively connected.

Based on this combined methodological and interpretive approach, this study constructs a clause-level corpus of Shanghai's industrial heritage-related policies from 2006 to 2025. Rather than focusing only on explicit industrial heritage policies, it extracts 524 relevant clauses from 86 policy documents across multiple policy fields. Using overall LDA modelling, stage-based LDA modelling and cross-period topic alignment, this study addresses three questions:

RQ1: What are the main themes that constitute Shanghai's industrial heritage policy agenda from 2006 to 2025?

RQ2: How has this policy agenda evolved across different policy stages?

RQ3: How does this evolution reflect the changing governance of industrial heritage in the context of the redevelopment of existing urban land and built assets, and what implications does it offer for post-industrial regeneration?

This study makes three contributions. First, it constructs a clause-level policy corpus that reflects the embedded and cross-sectoral nature of industrial heritage policies in Shanghai. Second, it combines overall topic identification, stage-based topic modelling and cross-period topic alignment to reveal the long-term reorganisation of the industrial heritage policy agenda. Third, by placing industrial heritage conservation, old factory reuse, industrial land transformation, cultural and creative industries, and urban regeneration governance within the same analytical framework, this study provides empirical evidence for understanding industrial heritage governance in China's urban regeneration

context, and offers implications for cross-departmental policy coordination and sustainable post-industrial regeneration.

The remainder of this paper is organised as follows. Section 2 introduces the research scope, data sources, clause-level corpus construction, periodisation, LDA modelling procedure and cross-period topic alignment method. Section 3 presents the overall thematic structure, stage-based topic structures and main evolutionary pathways of Shanghai's industrial heritage policies. Section 4 discusses the findings in relation to land redevelopment, national–local policy translation, the repositioning of industrial heritage, sustainable post-industrial regeneration and research limitations. Section 5 concludes the paper and outlines future research directions.

2. Materials and Methods

2.1. Research Scope Object and Data Sources

This study examines policy clauses related to the conservation, adaptive reuse and regeneration governance of industrial heritage in Shanghai from 2006 to 2025. The object of analysis is not confined to explicit industrial heritage policies; it also includes relevant clauses embedded in national and Shanghai municipal policy documents concerning heritage conservation, historic building conservation, cultural and creative industries, land use, planning implementation, urban renewal, industrial tourism, and public cultural services. This definition reflects the embedded and cross-sectoral nature of industrial heritage policy in Shanghai.

The year 2006 was selected as the starting point because it marked an important institutional moment for industrial heritage conservation in China. In that year, the First China Industrial Heritage Conservation Forum adopted the *Wuxi Proposal*, and the State Administration of Cultural Heritage issued the *Notice on Strengthening the Conservation of Industrial Heritage (Guanyu Jiaqiang Gongye Yichan Baohu de Tongzhi)*, indicating that industrial heritage had begun to enter the formal national policy agenda [36,37]. Although Shanghai had already experienced industrial relocation, old factory reuse and industrial land transformation before 2006, a specialised policy framework for industrial heritage had not yet been established. Therefore, the period 2006–2025 allows this study to examine the full policy process through which industrial heritage was gradually recognised, reused and incorporated into regeneration governance.

Policy texts were collected from legal and policy databases, official websites of central ministries, the Shanghai Municipal Government, and relevant municipal departments. Existing academic studies and policy reviews were also used for supplementary identification and cross-checking. After screening, exclusion and deduplication, the final corpus contained 86 policy documents and 524 policy clauses, including 30 national-level documents with 248 clauses and 56 Shanghai municipal documents with 276 clauses (Table 1).

Table 1. Basic composition of the policy corpus on Shanghai's industrial heritage, 2006–2025.

Policy Level	No. of Documents	Share (%)	No. of Clauses	Share (%)
National level	30	34.88	248	47.33
Shanghai municipal level	56	65.12	276	52.67
Total	86	100	524	100

2.2. Clause-Level Corpus Construction and Periodisation

2.2.1. Clause-Level Corpus Construction

This study uses policy clauses as the basic unit of analysis. A policy clause refers to a sentence, paragraph, or item that can express a policy objective, regulatory requirement, implementation measure, definition of a policy object, or policy instrument with relative

independence. Clause-level extraction was adopted because industrial heritage-related content is often embedded in documents with multiple policy objectives. If the entire document were used as the analytical unit, the specific meanings of individual provisions could be obscured.

The extraction followed three principles: semantic completeness, relative independence and direct relevance to the research questions. When a paragraph contained several independent policy actions, it was divided according to semantic boundaries. When several sentences jointly expressed one complete policy requirement, they were merged into one clause. Background descriptions, general promotional statements, and redundant expressions were removed if they did not directly contribute to the analysis. Through this procedure, formal policy documents were transformed into a structured clause-level corpus suitable for topic modelling and stage-based comparison.

2.2.2. Annual Distribution of Policy Clauses

The annual distribution of policy clauses was used to observe changes in policy attention over time. Since this study uses clauses as the minimum analytical unit, the annual distribution reflects not only the number of policy documents issued in a given year, but also the extent to which industrial heritage was incorporated into policy agendas. The distribution shows clear temporal unevenness and several boundary years, providing an empirical basis for periodisation (Figure 1).

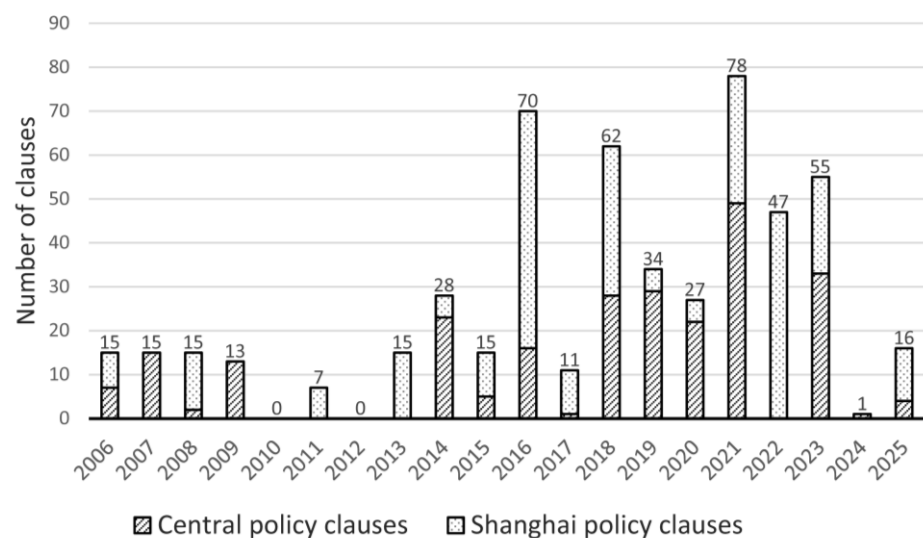


Figure 1. Annual distribution of policy clauses on Shanghai's industrial heritage and phase boundaries, 2006–2025.

2.2.3. Periodisation

Based on the annual distribution of policy clauses and key institutional nodes, this study divides the period from 2006 to 2025 into four stages: Stage 1 (P1), initial exploration, 2006–2010; Stage 2 (P2), regulatory consolidation, 2011–2015; Stage 3 (P3), revitalisation and renewal, 2016–2020; and Stage 4 (P4), integrated consolidation, 2021–2025. This periodisation reflects both changes in policy attention and shifts in the institutional context of industrial heritage governance (Table 2).

Table 2. Periodisation of Shanghai’s industrial heritage policies and key policy nodes.

Stage	Period	Stage Label	Main Features
P1	2006–2010	Initial exploration	Industrial heritage entered the national policy agenda; Shanghai began to explore old factory reuse and creative industry clusters.
P2	2011–2015	Regulatory consolidation	Industrial space transformation became more institutionalised; reuse of underused industrial land and OIA renewal became important.
P3	2016–2020	Revitalisation and renewal	Industrial culture, NIH, reuse of underused industrial land and cultural-creative development became more closely connected.
P4	2021–2025	Integrated consolidation	Industrial heritage became embedded in urban renewal, industrial culture, culture-tourism integration, public services and NIH management.

Stage 1 (P1) was characterised by the entry of industrial heritage into the national policy agenda and Shanghai’s early exploration of old factory reuse and creative industry clusters. Stage 2 (P2) marked a shift from project-based reuse to more explicit institutional management, with policies on industrial structure adjustment, old industrial area (OIA) relocation, the reuse of underused industrial land, and land management becoming increasingly important [38]. Stage 3 (P3) was characterised by the closer connection among industrial culture, national industrial heritage (NIH) recognition, reuse of underused industrial land, and cultural and creative development [39]. Stage 4 (P4) further embedded industrial heritage within urban renewal, industrial culture, culture-tourism integration, public services, and NIH management, supported by policy nodes such as *the Implementation Plan for Promoting the Development of Industrial Culture, 2021–2025 (Tuijin Gongye Wenhua Fazhan Shishi Fang’an (2021–2025 Nian))*, *the Shanghai Urban Renewal Regulations (Shanghai Shi Chengshi Gengxin Tiaoli)*, and *the Administrative Measures for National Industrial Heritage (Guojia Gongye Yichan Guanli Banfa)* [40–42].

2.3. LDA Modelling and Cross-Period Topic Alignment

2.3.1. Analytical Framework

This study combines overall LDA modelling, stage-based LDA modelling and cross-period topic alignment [28]. First, the full corpus from 2006 to 2025 was modelled to identify the overall thematic structure of Shanghai’s industrial heritage policies. Second, the corpus was divided into four sub-corpora according to the periodisation above, and LDA models were trained separately for each stage. Third, topics from adjacent stages were aligned to identify semantic correspondences and broader evolutionary pathways across policy stages. This framework makes it possible to examine both the thematic structure and the changing relationships among policy concerns over time (Figure 2).

2.3.2. Text Preprocessing and Feature Matrix Construction

Before topic modelling, all policy clauses were pre-processed. Each clause was treated as one document unit. Text preprocessing included Chinese word segmentation, part-of-speech filtering, domain dictionary supplementation, stop-word removal, synonym merging, low-frequency word filtering, and document-term matrix construction. The year of issuance was used for stage division, while policy level, issuing agency, and policy type were retained for topic interpretation and validation.

To retain terms that express policy objects, governance actions, and spatial attributes, this study mainly retained nouns, proper nouns, place names, verbs, nominal verbs, adjectives and nominal adjectives, while removing personal names, organisation names, numerals, conjunctions, prepositions, particles, adverbs, temporal words, punctuation, and other function words. A domain glossary was developed to identify compound terms such as ‘gongye yichan’ (industrial heritage), ‘gongye wenhua’ (industrial culture),

‘chengshi gengxin’ (urban renewal), ‘chanye gongdi’ (industrial land), ‘dixiao yongdi’ (inefficient land), ‘cunliang kongjian’ (existing industrial spaces), ‘gongye lüyou’ (industrial tourism), ‘wen-lü ronghe’ (culture-tourism integration), ‘guojia gongye yichan’ (national industrial heritage) and ‘lao gongye qu’ (old industrial areas) as integrated terms.

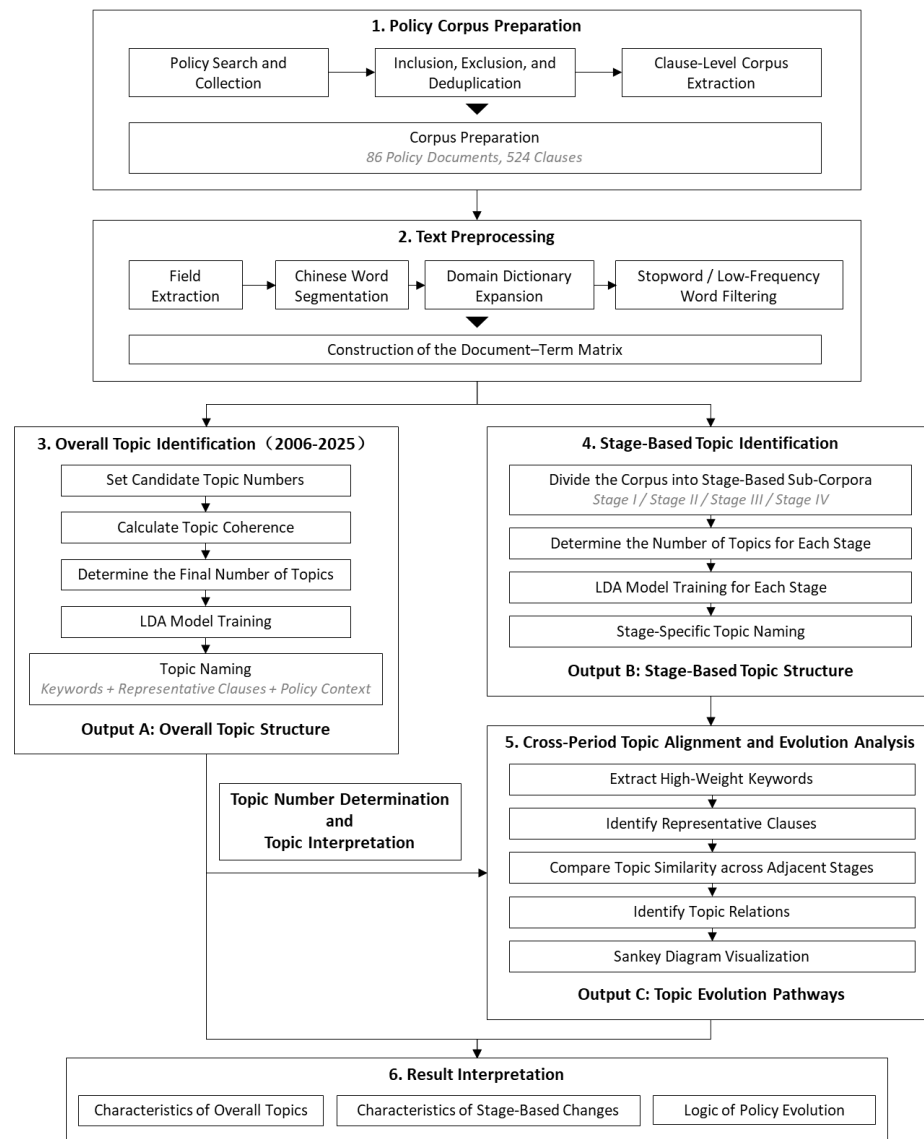


Figure 2. Workflow for policy topic identification and evolution analysis.

After preprocessing, a document-term matrix based on term frequency was constructed as the input for LDA modelling. Low-frequency word filtering was set to automatic mode, the high-frequency filtering threshold was set to 0.4, and the maximum number of terms was set to 10,000. Raw term frequency instead of term frequency–inverse document frequency (TF–IDF) weighting was employed as LDA is a generative probabilistic model that estimates latent topics from term distributions and word co-occurrence patterns [28,29]. For this clause-level policy corpus, frequently repeated terms such as land, industrial heritage, renewal, protection, reuse and industrial culture are not merely common words, but important indicators of stable policy agendas and governance concerns. Raw term frequency, therefore, helps preserve these recurrent policy signals, whereas TF–IDF weighting may down-weight terms that appear frequently across policy clauses but remain substantively important for interpreting policy agendas.

2.3.3. LDA Model Setting and Topic Number Selection

In this study, each policy clause was treated as one document, and the pre-processed terms were used as model input. During model training, alpha and beta were estimated automatically, and the number of iterations was set at 1000 to improve model stability.

The number of topics was determined by combining model evaluation indicators with substantive interpretability. For the overall model, different topic numbers were repeatedly tested. The coherence curve showed a relatively clear local turning point when the number of topics reached 11 (Figure 3). Topic coherence was used as an auxiliary indicator, while the final topic number and topic labels were further calibrated through keyword clarity, topic distinction, representative clauses and policy context [28,29,32,43].

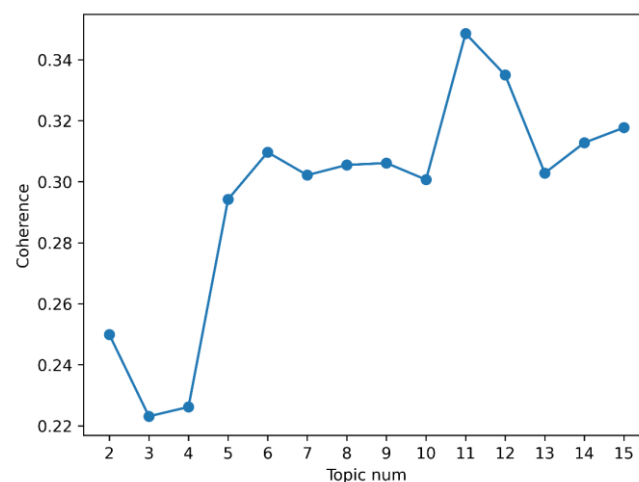


Figure 3. Topic coherence of the overall LDA model under different topic numbers.

Adjacent topic-number solutions were also inspected to assess the robustness of this choice. Although the coherence curve showed a possible turning point around 6 topics, the 6-topic solution was too broad for the purpose of this study and tended to merge land governance, industrial heritage conservation and functional reuse into overly general themes. The 10-topic solution produced a clearer structure, but still merged several analytically distinct concerns, especially those related to underused industrial land, OIA renewal and lifecycle governance. By contrast, the 12-topic solution generated a more fragmented structure, with some topics separated mainly by minor lexical differences rather than substantive policy meanings. This comparison supported the selection of the 11-topic solution as a more balanced and interpretable model for the overall corpus.

For the stage-based models, the same pre-processing rules and main parameter settings were applied. Topic numbers were determined according to corpus size, coherence, perplexity, topic distinction, and interpretability. The final topic numbers were 5 for P1, 5 for P2, 8 for P3 and 6 for P4 (Table 3). P3 adopted a larger number of topics because policy issues during 2016–2020 were more differentiated, involving land conveyance, land resource transfer, upgrading of existing industrial land, industrial heritage evaluation, NIH conservation and industrial culture innovation.

Table 3. Topic number selection and parameter settings for the overall and stage-based LDA models.

Model	Period	No. of Topics	Main Selection Basis
Overall	2006–2025	11	Local turning point in coherence curve, clear keyword structure, and interpretable policy meanings
P1	2006–2010	5	Suitable for the smaller corpus size and relatively clear thematic structure

P2	2011–2015	5	Balanced result between model indicators and topic interpretability
P3	2016–2020	8	Better differentiation of land governance, industrial heritage conservation, and industrial culture topics
P4	2021–2025	6	Relatively stable thematic structure with clear policy meanings

2.3.4. Topic Interpretation and Cross-Period Alignment

To avoid relying on statistical outputs alone, topic interpretation was conducted by combining high-weight keywords, representative clauses, policy metadata and domain knowledge. High-weight keywords were used to identify the semantic focus of each topic, while representative clauses were used to examine whether the topic reflected coherent policy content rather than merely statistical word co-occurrence. Policy metadata, including year, policy level, issuing agency and policy type, were used to situate each topic within its institutional context.

Cross-period topic alignment was then conducted to connect the stage-based topic results. Topics in adjacent stages were compared from three perspectives: high-weight keywords, representative clauses, and policy meanings. Rather than assigning a fixed category to each topic link, this study used cross-period alignment to identify broader patterns of thematic persistence, differentiation, integration, decline and emergence. This approach helped avoid both over-connection caused by weak keyword similarity and topic disconnection caused by semantic shifts across policy stages.

Finally, a Sankey diagram was used to visualise cross-period thematic evolution. In the diagram, nodes represent stage-based topics, node size indicates topic strength within each stage, and links represent semantic correspondences between topics in adjacent stages. The Sankey diagram serves as a visual synthesis of topic modelling results and policy interpretation, supporting the identification of major evolutionary pathways in Shanghai's industrial heritage policies.

3. Results

3.1. Overall Thematic Structure of Shanghai's Industrial Heritage Policies

3.1.1. Topic Identification in the Overall LDA Model

Based on the clause-level corpus of Shanghai's industrial heritage-related policies from 2006 to 2025, an overall LDA model was used to identify the long-term thematic structure of the policy corpus. The number of topics was set at 11 by considering the topic coherence, keyword clarity, topic distinction, representative clauses and policy interpretability. The results show that Shanghai's industrial heritage policies cover a wide range of issues, including industrial land governance, land supply and property-right transfer, urban renewal, reuse of underused industrial land, industrial heritage value recognition, NIH designation, industrial culture dissemination, industrial tourism development, and public service provision (Table 4).

Among the 11 topics, T1 'industrial land performance evaluation and resource allocation', T10 'industrial land supply and market transaction mechanisms', T7 'industrial heritage conservation research and reuse support', T5 'land development and lifecycle governance in urban renewal', and T11 'reuse of underused industrial land and OIA renewal' account for relatively high proportions, each reaching approximately 10% or more. This indicates that land use, industrial land governance, urban renewal and industrial heritage conservation jointly constitute the core concerns of the policy corpus. Industrial heritage is therefore not treated only as a cultural heritage object, but is also closely

connected with land redevelopment, industrial space transformation and urban regeneration governance.

Table 4. Overall LDA topics of Shanghai’s industrial heritage policies, 2006–2025.

Dimension	Topic	Topic Label	Share (%)	Interpretation
D1	T1	Industrial land performance and allocation	11.25	Industrial land allocation, inefficient land disposal, land-use performance evaluation, and reuse of existing land resources
D3	T2	Industrial tourism and historic space reuse	4.44	Reuse of industrial heritage, historic buildings, and industrial spaces for tourism, cultural services, and functional reuse
D4	T3	Land-right transfer and contracts	6.05	Land-use right transfer, contract arrangements and construction land management
D2	T4	Heritage value and creative reuse	9.42	Historical-cultural value recognition and connections with cultural creativity, design, and specialised industries
D4	T5	Lifecycle land governance in renewal	10.73	Land development, governance of existing land resources, use-right management, lifecycle supervision, and urban renewal
D3	T6	Industrial tourism and public services	9.44	Industrial tourism projects, science popularisation, public services, supporting facilities and community-oriented functions
D2	T7	Conservation research and reuse support	10.76	Industrial heritage conservation, conservation-and-use assessment, reuse support and value evaluation
D2	T8	NIH designation and industrial culture	7.60	NIH designation, industrial culture communication, museums, education and public cultural activities
D3	T9	Park renewal and R&D transition	9.28	Park land renewal, R&D functions, service-sector-oriented transformation and cultural-creative industry agglomeration
D1	T10	Land supply and market transactions	11.00	Land supply, bidding, auction, listing, market transaction, and land-use right allocation
D1	T11	Underused land and OIA renewal	10.02	Reuse of underused industrial land, OIA renewal, enterprise relocation, and land performance improvement

Overall, the 11 topics can be understood through four interrelated dimensions: land use and industrial land governance (D1), industrial heritage conservation and value recognition (D2), adaptive reuse and culture-tourism integration (D3), and implementation mechanisms and integrated governance (D4). Among these dimensions, land-related topics occupy a particularly important position, while heritage value, industrial culture, tourism, public services, and life-cycle governance also become visible in the policy corpus. This suggests that Shanghai’s industrial heritage policies have gradually moved from fragmented reuse and land regulation towards a more integrated policy framework combining conservation, reuse and regeneration governance (Table 4).

3.1.2. Annual Distribution of Overall Topics

To further examine temporal variation, each policy clause was assigned to its dominant topic, and the annual number of clauses under each topic was calculated. The annual heatmap shows an uneven distribution of the policy agenda over time. Topic concentration is particularly evident in 2016, 2018 and 2021–2023, indicating more active policy production and stronger thematic concentration (Figure 4).

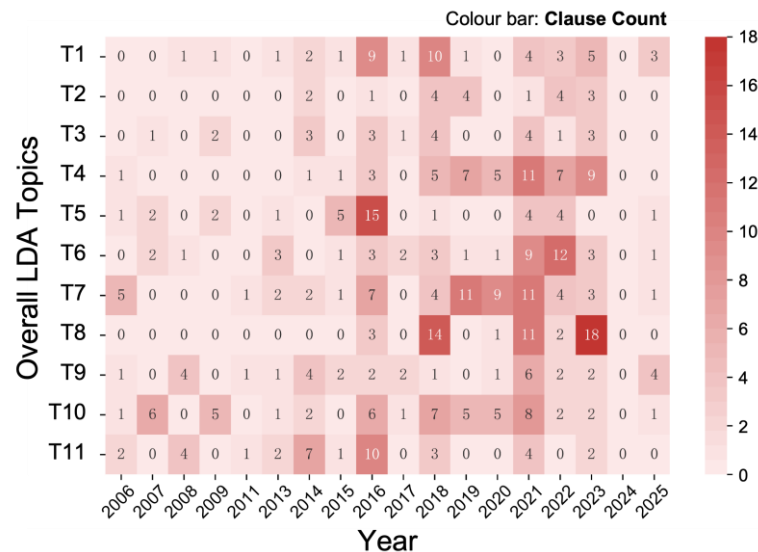


Figure 4. Annual distribution of overall LDA topics by policy clause count.

In 2016, multiple topics related to industrial land governance, the reuse of underused land, industrial heritage conservation, and functional transformation appeared simultaneously, suggesting that industrial heritage became more closely connected with land-use transformation and urban renewal. After 2018, topics related to parkland renewal, land supply mechanisms, industrial culture dissemination and industrial tourism became more prominent. During 2021–2023, urban renewal, industrial tourism, public service provision, and the conservation and use of industrial heritage were further strengthened, indicating a shift towards more integrated governance of EIS and adaptive reuse.

3.2. Stage-Based Thematic Structures and Their Correspondence with Overall Topics

3.2.1. Topic Identification Across the Four Policy Stages

On the basis of the overall LDA results, stage-based LDA models were applied to the four policy stages. According to the topic number selection described in Section 2.3, five topics were identified for P1, five for P2, eight for P3 and six for P4. The results reveal clear differences in the thematic structure of each stage (Table 5).

Table 5. Stage-based LDA topic identification results.

Stage No. of Topics		Stage-Based Topics
P1	5	I-T1: Land supply and reuse of old factory buildings;
		I-T2: Industrial heritage conservation and recognition of EIS;
		I-T3: Land market transactions and regulation;
		I-T4: Leasing and reuse of industrial heritage land;
		I-T5: Park function adjustment and industrial agglomeration
P2	5	II-T1: Industrial space governance and environmental improvement;
		II-T2: Industrial development transition and urban renewal;
		II-T3: Relocation and renewal of OIA;
		II-T4: Identification of underused industrial land and functional transition;
		II-T5: Industrial orientation adjustment and cultural-creative reuse
P3	8	III-T1: Land conveyance management;
		III-T2: Industrial heritage evaluation;
		III-T3: NIH conservation and development;
		III-T4: Industrial land development;
		III-T5: Heritage value;
		III-T6: Heritage culture innovation;
		III-T7: Land resource transfer;
		III-T8: Upgrading of existing industrial land

P4	6	IV-T1: Historical-cultural conservation and urban renewal; IV-T2: Industrial culture popularisation and tourism services; IV-T3: Industrial tourism innovation and public services; IV-T4: NIH recognition and management; IV-T5: Industrial project development and reuse of existing resources; IV-T6: Land development planning and renewal governance
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In P1, topics were mainly associated with land supply, old factory reuse, land market transactions, and the early recognition of industrial heritage conservation. In P2, the focus shifted towards industrial space governance, OIA renewal, industrial land transformation and cultural-creative reuse. In P3, topics became more differentiated, covering land conveyance, land resource transfer, upgrading of existing industrial land, industrial heritage evaluation, NIH conservation, and industrial culture innovation. In P4, the thematic structure showed stronger integration, with industrial heritage policies becoming more closely connected with urban renewal, industrial tourism, public services, NIH management, and land development planning.

3.2.2. Correspondence Between Overall and Stage-Based LDA Topics

To avoid treating the overall and stage-based LDA results as separate outputs, this study further compared the stage-based topics with the overall topic spectrum. Correspondence was identified by considering three aspects: overlap in high-weight keywords, similarity among representative clauses, and consistency in policy meanings. The results show that the stage-based topics can be embedded within the overall thematic structure of Shanghai's industrial heritage policies (Table 6).

Table 6. Correspondence between overall topics and stage-based topics.

Overall Topic	Topic Label	P1	P2	P3	P4
T1	Industrial land performance evaluation and resource allocation	-	II-T4	III-T8	IV-T6
T2	Industrial tourism and reuse of historic industrial spaces	-	-	-	IV-T2; IV-T3
T3	Industrial land property-right transfer and contract management	I-T4	-	III-T7	IV-T6
T4	Industrial heritage value recognition and cultural-creative reuse	I-T2; I-T5	II-T5	III-T2; III-T5; III-T6	IV-T1
T5	Land development and lifecycle governance in urban renewal	-	II-T2	III-T1; III-T4	IV-T1; IV-T5; IV-T6
T6	Industrial tourism project development and public service provision	-	-	-	IV-T2; IV-T3
T7	Industrial heritage conservation research and reuse support	I-T2; I-T4	-	III-T2; III-T5	IV-T1; IV-T5
T8	NIH designation and industrial culture dissemination	-	-	III-T3; III-T6	IV-T2; IV-T4
T9	Parkland renewal and R&D-oriented functional transformation	I-T5	II-T4; II-T5	III-T4	-
T10	Industrial land supply and market transaction mechanisms	I-T1; I-T3	-	III-T1; III-T7	-
T11	Reuse of underused industrial land and OIA renewal	I-T1; I-T4	II-T1; II-T2; II-T3	III-T8	IV-T5

The correspondence results indicate that land supply, industrial land governance, the reuse of underused industrial land, and the conservation and use of industrial heritage

recurred across different stages, although their specific policy meanings changed over time. By contrast, industrial tourism, public service provision, NIH recognition, and urban renewal governance became more prominent in later stages. This confirms that Shanghai's industrial heritage policies evolved from early reuse and land use regulation towards a more integrated framework combining conservation, adaptive reuse, land governance and public cultural uses.

3.3. Cross-Period Thematic Evolution and Main Pathways

3.3.1. Cross-Period LDA Topic Alignment

Based on the stage-based topic results and their correspondence with the overall thematic spectrum, this study further aligned topics across adjacent stages. The alignment was based on high-weight keywords, representative clauses, and policy meanings. The Sankey diagram does not assign a fixed evolutionary type to each link. Instead, it highlights the main semantic correspondences among stage-based topics and helps identify broader evolutionary pathways across policy stages (Figure 5).

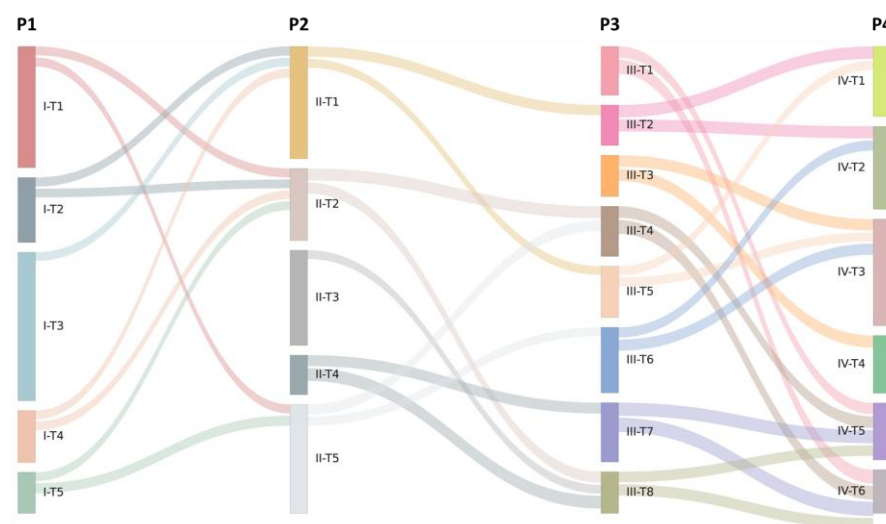


Figure 5. Sankey diagram of cross-period thematic evolution in Shanghai's industrial heritage policies. Nodes represent stage-based LDA topics, node size indicates topic strength within each stage, and links indicate semantic correspondences between topics in adjacent stages. Topic codes correspond to Table 5.

The Sankey diagram shows that Shanghai's industrial heritage policies did not evolve along a single linear trajectory. Instead, multiple thematic pathways developed in parallel. Early topics mainly concerned land supply, old factory reuse, land market transactions, and the initial recognition of industrial heritage. In the middle stages, policy attention shifted towards industrial land transformation, OIA renewal, the reuse of underused land, and industrial culture. After 2021, the thematic structure became more integrated, with industrial heritage policies increasingly connected to urban renewal, industrial tourism, public services, NIH management and land development planning.

3.3.2. Main Evolutionary Pathways

Based on the Sankey diagram, four main evolutionary pathways can be identified. The first pathway concerns land supply and industrial land governance. It begins with land supply, old factory reuse, and land market transactions in the early stage, and later develops into the identification of underused industrial land, land conveyance management, land resource transfer, the upgrading of existing industrial land, and renewal-

oriented land governance. This pathway shows that land use regulation remained a central thread throughout the evolution of Shanghai's industrial heritage policies.

The second pathway concerns the renewal of EIS and OIA. It links early industrial space reuse and park-based use adjustment with later transitions in industrial development, OIA relocation, the upgrading of existing industrial land, and industrial project development. This pathway indicates that industrial heritage was increasingly incorporated into broader processes of existing-space reuse and urban renewal.

The third pathway concerns industrial heritage conservation and value recognition. Early policy attention to industrial heritage conservation and the recognition of EIS was later strengthened through industrial heritage evaluation, heritage value recognition, historical and cultural conservation, and urban renewal. This pathway reflects the gradual transformation of industrial heritage from a reusable industrial resource into a more clearly defined object of conservation and value management.

The fourth pathway concerns industrial culture, tourism, and public services. Cultural and creative reuse and park-based use adjustment in earlier stages were later connected with NIH conservation, innovation in industrial culture, industrial tourism, public services, and NIH management. This pathway shows that the public, cultural, educational, and tourism-related roles of industrial heritage became increasingly prominent in the later stages.

Overall, the cross-period topic alignment indicates that Shanghai's industrial heritage policies evolved through the interaction of land use governance, the regeneration of EIS, heritage conservation, and public cultural use. Industrial heritage gradually became a policy field connecting industrial land transformation, urban renewal, and cultural heritage governance.

4. Discussion

4.1. From Land Redevelopment to Integrated Heritage Governance: Economic Restructuring and Land Constraints as Joint Drivers

The results show that Shanghai's industrial heritage policies have long been embedded in multiple policy fields, including land use, industrial land transformation, the reuse of underused industrial land, the renewal of EIS, urban renewal, and industrial culture dissemination. In the overall LDA results, topics related to industrial land performance evaluation, land supply mechanisms, the reuse of underused industrial land, and land development governance account for relatively high proportions. This indicates that land use and spatial redevelopment are central to understanding the evolution of Shanghai's industrial heritage policies.

Shanghai's GDP increased from 1029.697 billion yuan in 2006 to 5670.871 billion yuan in 2025, while the share of the tertiary sector rose from 50.6% to 79.3% (Table 7) [44–47]. This long-term restructuring is consistent with Shanghai's earlier strategy of '*retreating from secondary industry and advancing tertiary industry*' (*tui er jin san*, 退二进三), which has been promoted since the 1990s as a policy direction for restructuring the inner-city industrial economy. Under this strategy, traditional manufacturing activities in central urban areas were gradually relocated, reduced, or upgraded, while service, cultural, commercial, and innovation-oriented uses expanded. Many former factories, warehouses, and industrial sites were therefore transformed from production spaces into potential spaces for cultural and creative industries, commercial services, innovation activities, and urban regeneration. This helps explain why industrial heritage-related policies first appeared in fields such as old factory reuse, land supply, industrial park adjustment, and cultural and creative industry development [48,49]. In this sense, the topic shifts identified in this study were closely related to the transformation of former industrial land and buildings into EIS that could support service-sector, cultural and innovation-oriented urban functions.

Table 7. Economic restructuring in Shanghai, 2006–2025.

Year	GDP (Billion Yuan)	Share of Tertiary Sector
2006	10,296.97	50.6%
2016	27,466.15	70.5%
2021	43,214.85	73.3%
2025	56,708.71	79.3%

Data are from the Shanghai Statistical Communiqués on National Economic and Social Development for 2006, 2016, 2021, and 2025 [44–47].

Land constraints further reinforced this transition. *The Shanghai Master Plan 2017–2035 (Shanghai Shi Chengshi Zongti Guihua, 2017–2035)* requires the city to control its permanent resident population at around 25 million and to keep total construction land within 3200 km² by 2035, while emphasising strict control over new construction land and more intensive use of existing land [50]. Under these constraints, industrial heritage became both a cultural resource and a resource embedded in existing land and built assets. This explains why Shanghai’s industrial heritage policies were not concentrated in a single field of industrial heritage conservation, but were instead dispersed across land, industry, planning, urban renewal, culture, and tourism policies.

4.2. Policy Translation Across Scales: National Guidance and Municipal Operationalisation

The evolution of Shanghai’s industrial heritage policies reflects a process of policy translation across scales rather than a simple one-way implementation of national directives. Studies on policy mobility and scale-sensitive urban governance suggest that policy frameworks are not adopted locally as fixed models, but are reinterpreted and recombined through local institutional conditions, administrative capacities and development priorities [33,34]. In this study, national policies provided the formal recognition framework, institutional legitimacy and broad orientation for the conservation and adaptive reuse of industrial heritage. However, these frameworks were selectively translated in Shanghai through municipal policy instruments related to land use, planning implementation, industrial restructuring, urban renewal, cultural development and heritage management.

At the national level, the Ministry of Industry and Information Technology gradually institutionalised industrial heritage governance through the designation of NIH sites, management measures, periodic review and reuse-oriented requirements. By the end of 2025, seven batches of NIH sites had been announced; the seventh batch was released in October 2025 and included 32 projects [51]. Although the application process for the eighth batch falls beyond the study period, its launch in 2026 further indicates the continued institutionalisation of NIH governance [52]. These national frameworks helped define industrial heritage as a formal policy object and provided an institutional basis for its conservation, management and adaptive reuse.

Shanghai’s municipal industrial heritage designation system was established after the national framework had taken shape. Shanghai announced its first batch of 20 municipal industrial heritage sites in 2023, the second batch of 10 sites in 2024, and the third batch in 2025 [53–55]. This sequence indicates that Shanghai’s municipal system was closely related to national policy guidance, while also responding to local governance priorities. Rather than simply reproducing national policy categories, Shanghai operationalised industrial heritage governance through municipal designation, core-item identification, conservation and management requirements, and adaptive reuse guidance. These tools were further connected with local concerns such as the reuse of underused industrial land, industrial upgrading, waterfront regeneration, cultural consumption and urban renewal.

This selective translation was reinforced by Shanghai’s broader urban renewal and land-use agenda. *The Shanghai Urban Renewal Action Plan 2023–2025 (Shanghai Shi Chengshi*

Gengxin Xingdong Fang'an, 2023–2025) proposed the reuse of 30,000 mu of industrial land and more than 15 demonstration projects for historic building conservation, repair and adaptive reuse [56]. This suggests that industrial heritage governance in Shanghai was embedded not only in heritage recognition but also in the redevelopment of existing urban land and built assets. The national–local relationship was therefore not limited to administrative response. Rather, it generated a layered governance structure in which national designation, municipal identification, land policy and urban renewal instruments became mutually connected. At the same time, Shanghai's earlier experiments in old factory reuse, creative industry clusters and waterfront regeneration may have provided practical references for broader policy learning, although identifying direct feedback effects from municipal practice to national policy would require further institutional and comparative research.

4.3. Repositioning Industrial Heritage: From Reusable EIS to Public Cultural Resources

The topic evolution identified in this study indicates a clear repositioning of industrial heritage within Shanghai's policy system. In the early stage, industrial heritage-related clauses were mainly embedded in policies concerning old factory reuse, land supply, industrial park adjustment, and cultural and creative industry development. The policy identity of industrial heritage was therefore closely associated with reusable EIS. After 2016, topics related to NIH recognition, industrial culture dissemination, industrial heritage evaluation, industrial museums, and educational activities became more visible, indicating that industrial heritage was increasingly recognised as an industrial cultural resource and a medium for public culture.

This repositioning was reinforced by Shanghai's expansion of cultural consumption, public cultural services, and industrial tourism. Recent research on Shanghai's waterfront industrial heritage shows that museum-based adaptive reuse has become an important approach for sustaining urban memory, reconstructing cultural identity, and supporting waterfront economies [15]. Studies on post-industrial Shanghai also suggest that industrial heritage regeneration can generate broader urban effects when physical, economic, social, and cultural dimensions are integrated within policy and institutional systems [20,21,57]. These findings support the interpretation that Shanghai's industrial heritage policies have gradually moved from spatial reuse towards integrated regeneration governance.

This repositioning also raises governance challenges. Industrial heritage reuse in Shanghai is closely associated with high land value, cultural branding, tourism development and the production of public space. These factors can enhance heritage visibility, but they also require safeguards for historical interpretation, public accessibility and social equity. Existing studies have emphasised that post-industrial waterfront renewal in Shanghai should be evaluated not only in economic or spatial terms, but also in relation to heritage interpretation, spatial openness, public space quality and potential exclusion [14]. These tensions provide the basis for the policy implications discussed in the following section.

4.4. Sustainable Post-Industrial Regeneration and Bounded Implications for the Global South

The Shanghai case offers bounded implications for post-industrial regeneration in cities of the Global South and other rapidly urbanising contexts. These implications should not be understood as a universal model for all Global South cities, nor as a direct comparison with post-industrial regions such as Manchester, the Ruhr or Mumbai. Rather, the relevance of the Shanghai case lies in its institutional and procedural experience: how industrial heritage can be incorporated into land-use governance, urban renewal, cultural policy, tourism development and public-service provision under strong redevelopment pressure [14,15,57].

This discussion is also related to the Sustainable Development Goals (SDGs), especially SDG 11 on sustainable cities and communities. Industrial heritage conservation and reuse are directly connected with SDG 11.4, which calls for strengthening efforts to protect and safeguard cultural and natural heritage. They are also related to SDG 11.3, which emphasises inclusive, integrated and sustainable urban planning and management, and to SDG 8.9, which concerns sustainable tourism that promotes local culture [58,59]. From this perspective, Shanghai's industrial heritage policy evolution is not only a heritage conservation issue, but also part of a broader agenda of sustainable urban regeneration, resource reuse, cultural identity and public benefit.

The Shanghai case also reveals tensions that may arise when industrial heritage becomes part of regeneration under high land values and strong development pressure. Reuse can improve the visibility and economic value of former industrial sites, but it may also weaken historical interpretation, reduce public accessibility or marginalise everyday social uses [14,15,57]. These tensions cannot be addressed through project design alone. They require policy instruments that connect heritage identification, land-use regulation, adaptive reuse, public cultural provision and long-term operation.

Accordingly, the transferability of the Shanghai case should be understood as institutional and procedural rather than formal or project-based. Shanghai's strong land-use regulation and government-led urban renewal capacity may not be fully replicable in cities with different land institutions, fiscal capacities or administrative structures. However, several governance instruments may be adapted elsewhere. Cross-departmental review mechanisms can help coordinate heritage identification, planning control, land redevelopment, cultural programming and public-service provision before major functional conversion takes place. Public-interest clauses may also be incorporated into land redevelopment, leasing and renewal agreements to secure public accessibility, historical interpretation and long-term cultural use after adaptive reuse. In addition, early-stage industrial heritage assessment before land transfer or functional conversion, together with post-reuse monitoring of operational sustainability and social equity, can help prevent industrial heritage reuse from becoming a purely commercial redevelopment process. The key implication is therefore not to copy Shanghai's museums, creative clusters or waterfront projects, but to consider how conservation value, land-use efficiency, public benefit and long-term operation can be connected through institutional procedures.

4.5. Research Limitations and Future Research

This study has several limitations. First, it is based on formal policy texts and therefore analyses policy discourse, institutional priorities and governance instruments rather than implementation outcomes. The findings reveal how industrial heritage was framed and reorganised within Shanghai's policy system, but they do not directly measure whether these policies were fully implemented in specific sites or whether they produced the expected spatial, social or economic effects. A potential gap may therefore exist between policy discourse and actual implementation.

Second, although LDA topic modelling is useful for identifying latent policy themes and comparing topic structures across periods, topic-number selection, topic labelling and cross-period alignment inevitably involve interpretive judgement. This study reduced this uncertainty by combining model indicators, keyword clarity, representative clauses, policy metadata and domain knowledge. However, the resulting topics should still be understood as model-assisted interpretations rather than purely objective categories. Alternative methods, such as BERTopic, which uses transformer-based embeddings, clustering and class-based TF-IDF to generate topic representations, could provide additional semantic perspectives in future research [60,61]. Nevertheless, this study retained LDA because its topic-word probability structure, transparent document-term matrix and

compatibility with stage-based comparison are well aligned with the aim of tracing long-term policy agenda evolution and linking topics back to representative policy clauses.

Third, this study focuses on Shanghai as a single case. Although Shanghai is representative of China's government-led urban renewal and industrial land transformation, its strong land-use regulation, administrative capacity and policy resources are not shared by all Chinese cities or Global South contexts. Future research could combine policy text analysis with project-level case studies, interviews with policymakers and practitioners, GIS-based spatial analysis and comparative studies with other post-industrial cities. Such work would help further examine implementation effectiveness, social equity impacts, public accessibility and the long-term sustainability of industrial heritage reuse.

5. Conclusions

This study constructed a clause-level corpus of Shanghai's industrial heritage-related policies from 2006 to 2025, comprising 86 policy documents and 524 policy clauses. By combining overall LDA modelling, stage-based LDA modelling and cross-period topic alignment, it examined the thematic structure and evolutionary pathways of Shanghai's industrial heritage policies in the context of the redevelopment of existing urban land and built assets.

The findings show that Shanghai's industrial heritage policy agenda is highly composite and cross-sectoral. It has not been shaped by heritage conservation alone, but has evolved through the interaction of industrial land governance, reuse of underused industrial land, EIS and OIA renewal, industrial heritage value recognition, industrial culture, tourism, public services and urban renewal governance. Across the four policy stages, industrial heritage was gradually repositioned from reusable existing industrial space to a multidimensional governance object carrying industrial culture, urban memory, public service functions and regeneration potential.

This evolution was shaped by both local restructuring pressures and national–local policy translation. Shanghai's long-term industrial restructuring, tertiary-sector expansion and strict land constraints created strong demand for the reuse of former industrial spaces. At the same time, national industrial heritage frameworks and the urban renewal agenda provided institutional legitimacy and policy direction, while Shanghai selectively translated these frameworks into municipal designation, core-item identification, land-use instruments, adaptive reuse guidance and renewal mechanisms. This process shows that industrial heritage governance in Shanghai should be understood not as a single-sector conservation issue, but as a cross-scale and cross-departmental governance process.

The study contributes to industrial heritage and urban regeneration research in three ways. First, it provides clause-level evidence for understanding the embedded and cross-sectoral nature of industrial heritage policy. Second, it demonstrates the usefulness of combining overall topic identification, stage-based topic modelling and cross-period topic alignment to analyse policy fields dispersed across multiple departments and policy domains. Third, it links industrial heritage governance with land redevelopment, policy translation and sustainable post-industrial regeneration, thereby offering an institutional and procedural reference for cities facing similar redevelopment pressures. However, as discussed in Section 4.5, the implications of the Shanghai case should be understood within the limits of a text-based single-case study. Future research should further combine policy texts with implementation evidence, project-level cases, interviews, spatial data and inter-city comparison to examine the effectiveness, equity and long-term sustainability of industrial heritage policies.

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Abbreviations

The following abbreviations are used in this manuscript:

EIS	existing industrial spaces	
OIA	old industrial area	
NIH	national industrial heritage	
Policy glossary in Chinese, Pinyin romanisation and English translation in this paper		
Original Chinese Term	Pinyin Romanisation	English Translation
工业遗产保护	gongye yichan baohu	industrial heritage conservation
历史建筑保护	lishi jianzhu baohu	historic building conservation
存量工业用地盘活	cunliang gongye yongdi panhuo	reuse of underused industrial land
存量空间	cunliang kongjian	existing industrial spaces
存量空间治理	cunliang kongjian zhili	governance of existing industrial spaces
存量空间更新	cunliang kongjian gengxin	renewal of existing industrial spaces
存量空间再生	cunliang kongjian zaisheng	regeneration of existing industrial spaces
存量土地再开发	cunliang tudi zai kaifa	existing-land redevelopment
存量更新	cunliang gengxin	redevelopment of existing urban land and built assets
老工业区	lao gongye qu	old industrial area
老工业区搬迁改造	lao gongye qu banqian gaizao	old industrial area relocation
老工业区更新	lao gongye qu gengxin	renewal of old industrial areas/old industrial areas renewal
国家工业遗产	guojia gongye yichan	national industrial heritage
活化利用	huohua liyong	adaptive reuse/reuse

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