

## STRATEGIES AND EVALUATION OF URBAN REGENERATION OF HISTORIC INDUSTRIAL DISTRICTS FROM A LIFE CYCLE MANAGEMENT (LCM) PERSPECTIVE: A CASE STUDY OF YANGPU RIVERFRONT IN SHANGHAI (1075)

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**Abstract.** As developing countries have embraced rapid urbanisation and deindustrialisation since the end of last century, massive historic industrial districts sitting idle, due to industrial restructuring and land resource scarcity, have undergone spatial regeneration and industrial upgrading in large scale, as part of important efforts to improve urban spatial quality and functional capacity. However, regeneration of historic industrial districts is often impacted by the complicated relationship among stakeholders, burdensome red tape, and high requirements for historical preservation. Therefore, it will inevitably lead to a raft of consequences, such as dissension among different parties, divided planning, construction, and management, and mismatch between inputs and earnings. In this context, a regeneration management system featuring multiple parties, whole process, and whole elements underpins the sustainable regeneration of urban historic industrial districts. This coincides with the idea and content of LCM, which provides a possible solution to the sustainable regeneration of urban historic industrial districts. By drawing on the theory and methods of LCM and corresponding to its 'Plan-Do-Check-Adjust' theoretical approach, this study an LCM framework for the regeneration of historic industrial districts. The framework includes 'institution formulation, stake-holder organisation, resource introduction, right transfer, planning and construction, operation and management, supervision and evaluation, feedback and adjustment'. This study also systematically reviews the strategies, experiences, and challenges of each stage in the regeneration of the Yangpu Riverfront Historic Industrial District in Shanghai, which is a key area for upgrading the city's overall strength. The effectiveness of the LCM system is also evaluated, with a view to contributing to the theoretical and practical aspects of urban regeneration planning and management, and beefing up the city's ability to respond to challenges and uncertainties.

**Keywords:** Life Cycle Management (LCM); Urban Regeneration; Historic Industrial Districts; Yangpu Riverfront in Shanghai

## **1. Introduction**

### **1.1 Systematic and Sustainable Urban Regeneration in a Global Political and Economic Context**

With deepening global urbanisation, overconsumption of resources, and rapid and dramatic changes in international political and economic relations, people are grappling with compound problems as a result of pandemics, climate change, loss of history and culture, and urban inequalities. In the face of the dual challenges of short-term shocks and long-term pressures, cities should be well-positioned to improve their resilience, sustainability and inclusiveness. Global cities are areas where the majority of the population lives, and the share of their population will climb from 56 percent in 2021 to 68 percent by 2050, with more conflicts and lesser development potential there. Actually, cities should be the focus of our efforts to alleviate value and cultural conflicts and diminish environmental and social problems, and the leading players who take specific actions to realise comprehensive development goals.

Urban regeneration is not only a key stage to intensively present achievements of urban development, but also will serve as an ongoing effort in the development of a city [1]. It is a process of continuously reconstructing geographical space and social economy, which can effectively reinforce the value of production factors, reshape subject relationships, and redistribute interests. It is an important path to respond to conflicts and challenges and achieve the strategic objectives of cities. Urban regeneration is also faced with challenges. Due to its long cycle and wide span of expertise, truly sustainable urban regeneration cannot just be achieved by efficiently completing some parts of the process, but inevitably requires a life cycle of systematic upgrading and integrated management.

### **1.2 Necessity and Complexity of Regeneration of Historic Industrial Districts**

Regeneration of historic industrial districts is an important part of urban regeneration, with preservation and reuse of these districts being a common issue in cities worldwide [2]. Since the end of the last century, developing countries have seen rapid urbanisation and deindustrialisation. In China, the industrial land makes up about 20 percent of the country's construction land, while the share of manufacturing in GDP has fallen from 40 percent in the 1980s to 26 percent in 2020. Industrial restructuring has led to massive historic industrial districts sitting idle. In addition, the urban development model has shifted from expansion to stock-based regeneration, due to limited land resources. Massive historic industrial districts sitting idle have undergone large-scale spatial regeneration and industrial upgrading, as part of important efforts for the improvement of urban spatial quality and functional capacity [3]. The regeneration of historic industrial districts is often impacted by the complicated relationship among stake-holders, burdensome red tape, and high requirements for historical preservation. Therefore, it will inevitably lead to a raft of consequences, such as dissension among different parties, divided planning, construction, and management, and mismatch between inputs and earnings [4]. It has evolved into one of the major obstacles to fulfilling

the objective of historical and cultural preservation and sustainable regeneration.

### **1.3 Concept and Methods of LCM**

In recent years, cities in China have carried out regeneration of historic industrial districts in large scale by introducing the LCM concept and methods for research evaluation and practical guidance on their urban regeneration and management. LCM, derived from Life Cycle Thinking (LCT) [5], can be generally understood as the entire process ‘from cradle to grave’, which originated from biology and were later applied in many fields such as politics, economics, environment, technology, and society. Aiming to broaden the perspective and improve the defect of the traditional focus on a single and fixed process, LCM offers ideas and strategies to optimise all stages of a product's life cycle.

LCM is a concrete application of LCT. The United Nations Environment Programme (UNEP) and Society of Environmental Toxicology and Chemistry (SETAC) define it as ‘a product or organisation management system aiming to minimise the environmental and socio-economic burdens associated with product or product portfolio throughout its entire life cycle and value chain’. Keeping tabs on the continuous improvement in the product or organisation management system, LCM is more than a single tool or methodology. It is a management system collecting, structuring, and disseminating product or organisation-related information throughout its entire life cycle from various programs, concepts and tools [6], so as to realise the systematic upgrading. At present, LCM is mainly applied in four fields, i.e., product, enterprise, industry, and solid waste. Cities, as giant complex systems, also need to plan, build, and manage their regeneration and development process in a coordinated way from the perspective and approach of LCM, in a bid to achieve sustainable enhancement of their social, economic and environmental elements.

By drawing on the theory and methods of LCM and corresponding to its ‘Plan-Do-Check-Adjust’ theoretical approach, this study develops an LCM framework for the regeneration of historic industrial districts. The framework includes ‘institution formulation, stake-holder organisation, resource introduction, right transfer, planning and construction, operation and management, supervision and evaluation, feedback and adjustment’. As a key area helping achieve the city’s strategic objectives and the case elaborated in this study, the Yangpu Riverfront Historic Industrial District in Shanghai is regenerated by a consortium composed by government, developers, and social organisations to carry out overall management of the institution, construction, operation, and adjustment of the regeneration. By systematically reviewing the key strategies and achievements in each part of the case, this study also summarises the experiences and difficulties in regenerating and managing the Yangpu Riverfront Historic Industrial District. In addition, the effectiveness of the LCM concept and system framework is also evaluated, with a view to contributing to the theoretical and practical aspects of urban regeneration planning and management.

## **2. Methodology--Case Study**

### **2.1 Plan**

### 2.1.1 Institution Formulation

**Efforts were made to explore and implement urban regeneration policies such as land transfer premium sharing.** As some industrial land has been owned by enterprises, collectives, or individuals historically, urban regeneration is predicated on the transfer of land ownership, which, however, is impeded by mounting land prices. In response to this, Shanghai introduced some incentive policies such as the *Implementation Measures of Shanghai on Putting Its Stock Industrial Land into Good Use*, stipulating that the original land owners were allowed to participate in the premium sharing and share the benefits after their land ownerships were transferred. The policy fully mobilised the enthusiasm of factory owners, and accelerated the transfer of land ownerships. It also helped print an encouraging picture of ‘government-enterprise cooperation, benefit-sharing, and responsibility-sharing’, gradually resolved the historical land ownership problems, and laid a good foundation for the city’s large-scale urban regeneration.

**The development strategy in synergy with the planning of ‘One River, One Creek’ was formulated to create a world-class waterfront.** ‘One River, One Creek’ refers to the Huangpu River and the Suzhou Creek respectively in Shanghai. Banks of the Huangpu River were set to be the central showcase of Shanghai’s international metropolitan development capabilities while banks of the Suzhou Creek were positioned as a typical demonstration area for livable life in a megacity. The planning of ‘One River, One Creek’, driven by the city’s development strategy since the end of the 20th century, has become the focus of Shanghai’s march towards an excellent global city. The functional capacity and environmental quality of banks of the Huangpu River saw significant improvement before and after the Expo 2010 Shanghai China. Subsequently, Shanghai also embarked on the historical resource survey and area planning for the Yangpu Riverfront section. By the end of 2017, the 45-kilometre core section along the Huangpu River was basically upgraded from an abandoned and closed factory area to an open and interconnected urban public waterfront. Shanghai proposed to develop the waterfront areas of ‘One River, One Creek’ into a world-class area built, governed, and shared by the people, and to enable the development along the Huangpu River to enter a new stage with more attention paid to its quality, charm and humanistic care, during the ‘14th Five-Year Plan’ period. Yangpu Riverfront, as the ‘world’s largest remaining industrial heritage exposition belt’, is located in the seat of ‘a Science and Technology Innovation District’. Thanks to its rich historical and cultural heritage and strong development potential, it has become a critical impetus to help realise the ‘One River, One Creek’ development strategy [7].

**Positive development planning was made to boost the transformation of ‘Rust Belt’ to ‘Living Corridor’ and ‘Innovation Hub’.** In September 2020, the National Cultural Heritage Administration announced the list of the first batch of demonstration zones for the protection and use of cultural heritage resources, in which Yangpu Riverfront was included. In March 2021, the *Implementation Plan for the Construction of Shanghai Yangpu Living Corridor Demonstration Zone for the Protection and Use of Cultural Heritage Resources (2021-2023)* was released, which specifically guided the area to transform itself into a living

service functional area. The construction of the demonstration zone was also included in the Yangpu District’s ‘14th Five-year’ development plan. Nowadays, the completed first round of urban regeneration has achieved the transformation of Yangpu Riverfront into a living service area. Specifically, the industrial heritage was combined with ecological greenbelt to create a centre for leisure services, and exhibition and performance activities, and to form a large-scale interconnected thematic sightseeing route. The remaining outbuildings, equipment, and facilities of previous factories were fully utilised and transformed into sports stations and cafés to provide convenient services for citizens and visitors. Art exhibitions, performances, cycling and recreational activities are often organised to create a refreshed ‘Living Corridor’ where natural and humanistic landscapes coexist in harmony.

In the second round of ongoing urban regeneration, Yangpu Riverfront will be largely driven by the functional transformation and spatial transformation of the riverfront hinterland, to help build the Yangpu District into a ‘Science and Technology Innovation District’ and Shanghai into ‘an Innovation City’. At the beginning of 2021, the ‘Changyang Hub’ Shanghai Online New Economy Ecological Park was officially inaugurated in Yangpu Riverfront, marking the official start of construction of a world-class innovation landmark featuring the online new economy. At present, a number of leading Internet enterprises such as Meituan, Bilibili, and Douyin have settled here and started their projects. Yangpu Riverfront is planned to be built into an innovation landmark to represent Shanghai in international competition and cooperation.



Figure 1. Regulatory Detailed Planning of the Southern Section of Yangpu Riverfront in Shanghai (December 2021 version, re-drawn by the author)

2.1.2 Organisational Structure

**A ‘government-developers-social organisations’ joint mechanism led by the government was developed.** A special working mechanism led by the vice mayor in charge of relevant matters was established to hold regular working meetings. A demonstration zone construction leading group closely aligning the Shanghai Municipal Administration of Cultural Heritage with the Yangpu District was established to guide the work with clear division of labour. The Yangpu Riverfront Comprehensive Development and Management Command,

established by the Yangpu District Government, Shanghai Yangpu Riverfront Investment and Development (Group) Co., Ltd. (hereinafter referred to as 'Riverfront Company'), and some industrial enterprises with own property rights, formed a three-party urban regeneration consortium. It was designed to combine government and market forces to complete specific comprehensive development and management work.

**Land acquisition and reserve were combined with cooperative investment to explore multi-level collaborative implementation methods.** The city and district governments jointly carried out land acquisition and reserve, with support from the city level in terms of capital investment, financing, and balance. Development funds were shared between the financial department and Riverfront Company, with district-level financial funds used for the renovation of the historic buildings and funds allocated for Riverfront Company used for the plumbing, electricity and heating connections and interior decoration to match the new functions at later stages. Such a collaborative approach to urban regeneration made it possible for historic buildings to be properly preserved, while facilitating early determination of functions, and avoiding redecoration problems caused by the incompatibility between repair and renovation and subsequent functional use requirements.

**A team of experts was introduced to provide decision-making support, with a government-society multi-party supervision mechanism.** Yangpu Riverfront Comprehensive Development Management Decision-making Advisory Committee was a decision-making advisory body under the leadership of Yangpu Riverfront Comprehensive Development Management Command, whose expert members were divided into three groups, namely Planning and Construction Group, Industry Group, and Governance Group. It was established to make more scientific decisions by virtue of the comprehensive advantages and decision-making advisory role of multi-disciplinary and cross-disciplinary experts. Yangpu Riverfront Governance Consortium was jointly initiated and established by four units involved in the planning and design, development and construction, management and operation of the area's regeneration, and has received positive response and participation from 43 enterprises, units, social organisations, and other players in the area, covering wide fields such as real estate development, traditional industry, financial investment, architectural design, social undertakings, social services, and professional services. The organisation will focus on five major professional fields including riverfront development planning, urban construction, industrial operation, digital transformation, and social services, to promote the urban regeneration and urban governance level of the historic industry district. Furthermore, it will continue to render more channels available for collecting people's suggestions, and build the citizen service station in the public space into a construction platform to promote the whole process of people's democracy, so as to provide citizens with reliable channels to participate in the city's regeneration.

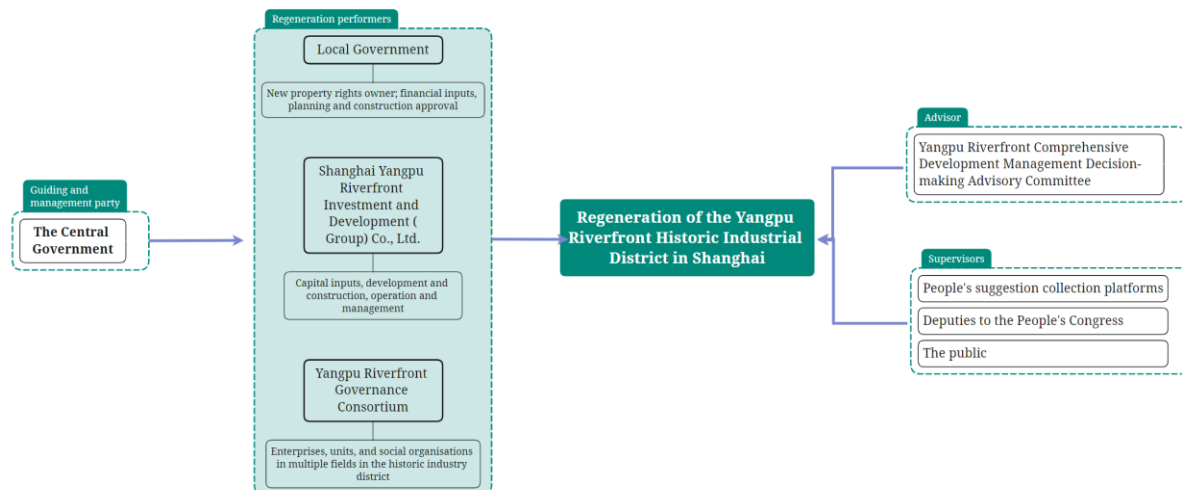


Figure 2. Structure Diagram of Stake-holder Organisations (Drawn by the authors)

### 2.1.3 Resource Introduction

**More and better resources were put into cultural and artistic events and sports activities, to bolster the high-quality regeneration in the area.** Cultural and artistic events and sports activities were held to help improve the quality of district regeneration. In the past five years, the previously closed Yangpu Riverfront area was gradually opened up to the public. The former factories have been transformed into public spaces providing leisure services for citizens, and a large number of world-class cultural and artistic activities and sports events were held in the area. For example, the World Cities Day-Shanghai Forum 2018, the Third Shanghai Urban Space Art Season 2019, and the 2021 FIS Cross-country Skiing China City Tour were staged here. Each large cultural activity and sports event has contributed to the significant enhancement in the space quality, cultural influence, and brand image of the area.



Figure 3. Before and after urban regeneration comparison photos of Yangpu Riverfront

## 2.2 Do

### 2.2.1 Planning and Construction

**Systematic assessment of the historic industrial district and heritage value tapping was carried out, with the scope of industrial heritage preservation and protection extending.** Since 2003, a team of experts had been conducting research on existing problems and preservation and regeneration strategies of the Yangpu Riverfront. After 2013, the relevant departments began to organise a systematic and comprehensive mapping study and value determination of heritage resources in the area. On the basis of the original regulatory plan, 18 preservation objects were expanded to preserve and protect the industrial heritage of 66 buildings in Yangpu Riverfront with a total area of over 260,000 square meters. In addition,

the workers' new village north of the Riverfront and other workers' living support areas are preserved and retained as part of the overall appearance.

**While planning the spatial layout, the industrial historical features were preserved and continued to the greatest extent.** The regulatory planning was adjusted in synergy with architectural protection, and innovative approaches were adopted to mediate the conflicts between newly planned roads and historic buildings under preservation. Taking the planning and construction of Anpu Road as an example, in order to adapt to the new planning of regional positioning, this road was planned to cross general historical buildings such as the Machine Repairing Warehouse of the Tobacco Company and the Finance Building of Andersen, Meyer & Co., Ltd.; thanks to the coordination of multiple departments, the boundary lines of this road were innovatively adjusted so that it could run parallel to the column grid from the ground floor of the building. In this way, only the ground floor of the building needed to be emptied, without affecting the use of space above the second floor. The impact on road capacity was minimised while safeguarding the preservation of historic buildings in situ.

**According to the classification system, the preservation and utilisation strategy was formulated in a targeted and systematic manner.** As the 'world's largest remaining riverfront industrial heritage exposition belt', Yangpu Riverfront abounds with industrial heritage sites and thus is faced with a complex situation. In spite of this, the specific preservation and regeneration strategy was formulated for each of them. Depending on the degree of intervention, there were three types of measures taken including continuity-oriented preservation, adaptive reuse, and public space shaping. Continuity-oriented preservation applies to the industrial heritage with a high preservation level, important historical, cultural, and socio-economic values, and whose production functions can still meet the current needs, such as Yangshupu Water Plant (Figure 3) and the Sacred Heart Hospital. These industrial heritage sites can still be used after they are properly restored and preserved. Adaptive reuse applies to the industrial heritage that has lost its original function but has distinctive architectural style, building structure, and cultural history. They can be reused without changing their original architectural structures. This type of measure attaches great importance to the infusion of new spatial elements and functional activities into the industrial heritage, while retaining and preserving its character and historical information as much as possible, so that it can be integrated into contemporary urban life [8] [9]. The Shanghai Fashion Center (SFC) is a striking example of this type. Public space shaping applies to the buildings and landscape sketches without outstanding values. They can be transformed into public space elements by changing their structures to continue the integrity of the historic industrial landscape. Typical examples of this type include but not limited to the Green Hill (an urban riverfront complex) (Figure 4), the Rain Garden transformed from a polluted puddle, the abstracted and symbolised tube-like streetlights, and high-pressure container-like garbage cans [10].



Figure 4. Yangpu Riverfront Cycling and Jogging Belt



Figure 5. Aerial View of the Buildings at Yangshupu Water Plant



Figure 6. Green Hill (Photo by Tian Fangfang)

### *2.2.2 Operation and Management*

**The planning, construction, and management were coordinated to build an overall regional coordination and implementation platform for the whole life cycle.** In view of the inevitable discrepancies between the regulatory planning and the project construction and implementation, and given the long period of adjusting the planning, it is a tough task to coordinate the planning and implementation. To solve this problem, Shanghai has innovatively launched the ‘Construction Project Planning and Implementation Platform’,

which is led by the Shanghai Urban Planning and Natural Resources Bureau, supported by the review of regional master plans and construction project design plans, and brings agencies in planning, architecture, structure, flood control, transportation, and other fields together to integrate development, design, construction, operation, management, and other aspects to manage construction projects throughout their whole life cycle. As a key area of 'One River, One Creek' development planning, Yangpu Riverfront was given the chance to be the first to use this platform, benefiting from which its regeneration has received favourable coordination in terms of building construction boundary, fire protection organisation, and afforestation balance. Additionally, while implementing the renovation projects, the issue of business format introduction was considered in advance, and the planning and design were carried out in combination with the new functional requirements. The actual use scenarios of the owners were taken into full consideration to avoid the mismatch between the repair and renovation and the new business formats, thus leading to redecoration. The requirements of subsequent management and utilisation were put into the planning and design process for early consideration.

**Efforts were made to explore the dynamic balancing of funds through 'branded' and 'market-oriented' building.** The transformed Yangpu Riverfront has created a brand image intermingling industrial technology with modern art, thus being a preferred place for large cultural and artistic events and commercial activities in the city. During the Shanghai Tourism Festival, Yangpu Riverfront was selected as one of the six 'Shanghai Cultural and Tourism Promotion Windows in 2020' by virtue of 'the most warm-hearted living corridor'. In June 2021, the fourth Yangpu District Parent-Child Carnival and the third Yangpu District Parent-Child Reading Competition were held at the SFC. The ninth Shanghai Citizen Art Exhibition and the 2022 Shanghai International Photography Festival (SHIPF 2022) and the 16th Shanghai International Photography Art Exhibition were held at the Maoma Warehouse. In addition to the city's public art and cultural activities, some leading international commercial brands were also attracted by the 'non-standardised venues' in the area, such as the LV show at the Ruirong Shipyard Dock with an investment of Rmb100 million, and the YSL new product launch at the Ash Gallery of Yangshupu Power Plant. Besides, the BMW XM series new product recommendation meeting, the Genesis G70 new car launch, the Tiffany fine jewellery appreciation meeting, and other commercial activities were also held in the area. The income from commercial activities will not only cover the maintenance cost of the old buildings, but also support the operation of other non-profit spaces of the Yangpu Riverfront. What's more, the improvement in the area's brand benefits and influence will bring about a more vibrant regional economy.



Figure 7. Fashion events and civic leisure activities

### 2.3 Check

**The supervision and assessment mechanism of the management departments was improved.** Implementation plans were formulated to clarify objectives and responsibilities and strengthen assessment at various stages. Performance assessment methods for different work objectives and responsibilities were separately developed, and both assessment at different stages and annual assessment were implemented, with assessment results included into the scope of political performance assessment of leaders at all levels, so as to guarantee the conscientiousness of leaders and the effectiveness of urban regeneration.

**Paths and effects of public supervision were strengthened.** Public opinions were highly valued, as evidenced by the wider scope of work processes open to the public and more public opinions accepted. For example, Shanghai Yangpu District Urban Planning and Land Administration Bureau released the *Regulatory Detailed Planning Revision of Yangpu Riverfront (Draft)* for public view. A total of 102 comments and suggestions were received in one month, which were carefully reviewed and responded by relevant government departments. Moreover, thanks to China's unique system of People's Congress, some public opinions can be conveyed to government departments and relevant responsible units through deputies to the People's Congress. In addition, the mayor's hotline, as the most convenient way for the public to provide feedbacks, has established a smooth channel for communication. Feedbacks on rectification were regarded as a basic requirement and evaluation indicator, to ensure the effectiveness of public feedbacks.

### 2.4 Adjust

**The public's comments on the utilisation were valued, to continuously update and improve the quality.** As a riverside park open to the public, its facilities and equipment are constantly updated and upgraded based on the public's feedbacks on the utilisation. For example, by virtue of the People's Congress system, the deputies made specific suggestions on the height of the slide and the depth of the women's toilet seat in Shanghai Yangshupu Power Plant Heritage Park, for which Riverfront Company, responsible for the park's management, made positive responses and rectification. The Company also took moves to identify other defects in the park area to meet the needs of different groups of people, especially children, thereby

making the park more accessible, safe, and comfortable.

**Regeneration measures were taken in batches with timely adjustments.** The urban regeneration of Yangpu Riverfront was not done overnight, but was carried out in batches according to different zones and types over a longer period of time, in order to monitor the deficiencies and demands of the completed parts, absorb feedback and suggestions about them, and make timely supplements and adjustments subsequently. Yangpu Riverfront has a total length of 15.5 kilometres, and covers a total area of 12.93 square kilometres, with a vast hinterland area. The urban regeneration of Yangpu Riverfront is to finished in two rounds. The first round aims to update its riverfront public spaces. The 5.5-kilometre core area of the southern section was fully opened in 2019, while the scientific and technological development orientation in the central and northern sections is separated from the living service functions of the southern section and complements each other. Currently, these two sections have entered the urban design phase and are expected to be fully opened in 2025. In the hinterland area, the ‘Changyang Hub’ online new economy ecological park has been established to attract industries, capital, and people. This not only supplements the functions and funds of the riverfront public spaces but also provides more channels to help public resources in the area play their full role.



Figure 8. facilities adapted to the needs of the users after adjustment.

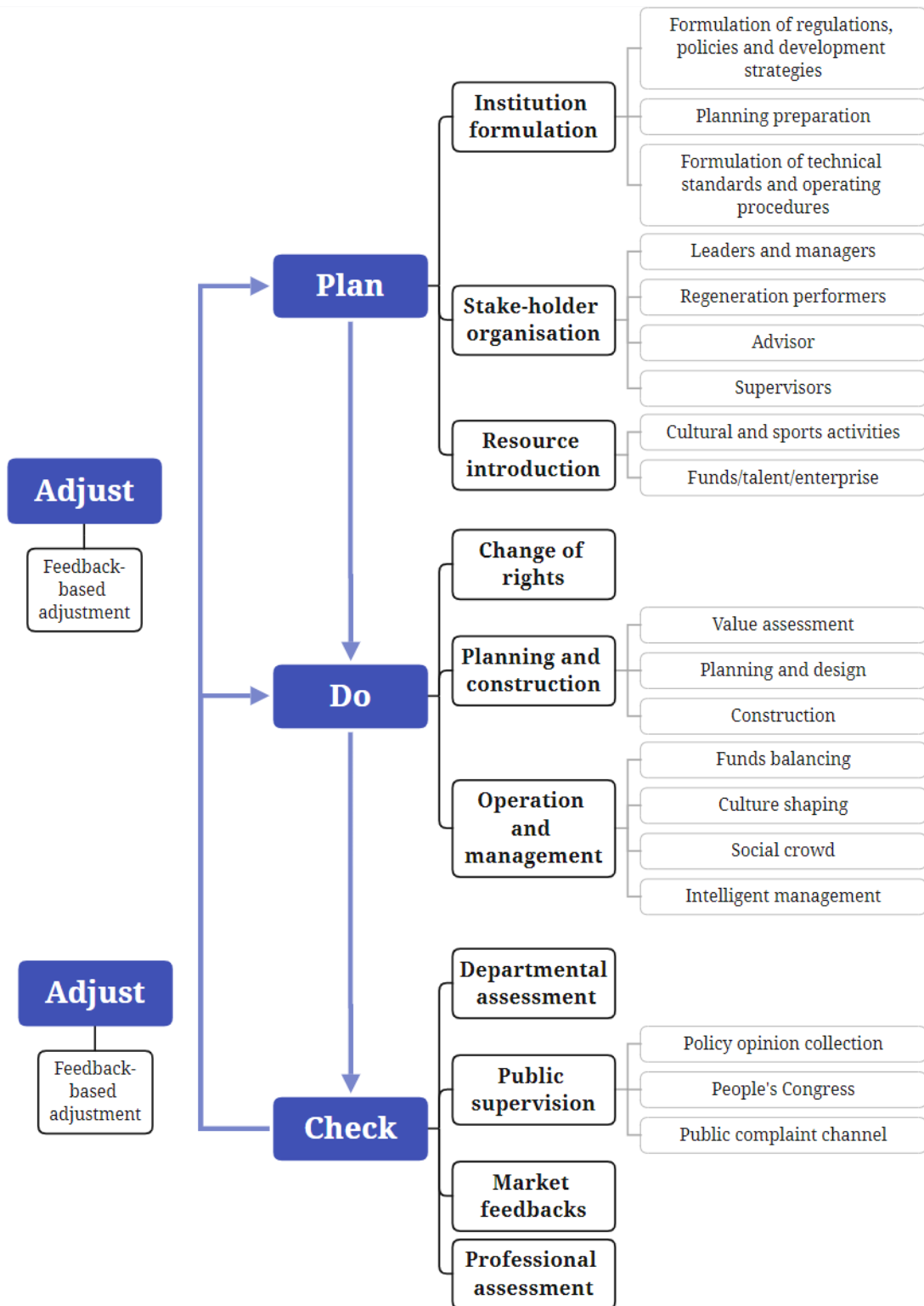


Figure 9. LCM Framework for the Regeneration of the Yangpu Riverfront Historic Industrial District (drawn by the authors)

### 3. Results And Discussions

#### 3.1 Evaluation of the Effectiveness of LCM

Relying on its advantages such as being holistic, synergistic, and systematic, LCM can provide overall guidance for the complex process of urban regeneration.

**Previous urban regeneration measures often tended to focus solely on spatial regeneration, while the LCM approach can break through such a limitation by focusing on overall effectiveness, to effectively improve the sustainability of urban regeneration.** Urban regeneration is a complex process involving the value enhancement of production factors, redistribution of interests, and coordination of stake-holder relations. The historic industrial districts, due to their diverse ownerships, complex historical legacies, and numerous conflicting value elements, particularly call for LCM ideas during their regeneration process. It is advisable to consider all aspects of the regeneration as a whole and form an integrated management approach to avoid unsustainable regeneration due to segmented and unconnected processes. It will also shape a complete, effective, and sustainable closed loop for regeneration to get an overall effect.

**LCM can promote regional coordination and professional collaboration, providing a platform for communication and cooperation of multiple stake-holders.** As an important public affair, urban regeneration involves a wide range of stake-holders and regions, which often act on their own due to the lack of cooperation mechanism. The LCM concept provides a platform for information exchange and an overall management approach, which boosts a high degree of synergy between different departments and a cooperative alliance between different regions. By virtue of this concept, a cross-region cooperation and multi-party coordination mechanism for urban regeneration will be effectively established.

**The LCM concept summarises the regeneration process into a complex system with rich layers.** In this system, there is top-level system design, mid-scope mechanism organisation, and the micro implementation and execution. Throughout the process, urban regeneration challenges and development needs are fully considered, while taking into account the logic of interaction between multiple stake-holders and the composition of socio-cultural relationships in specific cases. The LCM system, with its advantage of hierarchical management, takes local relevance and flexibility into full consideration.

#### 3.2 Experience of Yangpu Riverfront Life Cycle Regeneration Management

**Sustainable regeneration and use are predicated on a mechanism established for mutual benefits and supervision among multiple stake-holders.** There are multiple stake-holders involved in the urban regeneration process, who have complicated relationships. In addition to the regeneration performers composed of the local government, developers, and governance consortium, the public and social organisations are also involved to monitor the regeneration process and the decision-making advisory committee gets involved to serve as the advisor. Multiple stake-holders such as the government, private enterprises, experts and

scholars, and local communities are involved and pool their efforts to combine spatial regeneration with broader social and economic issues such as social services, commercial investment, and environmental improvement. The paths and ways to share responsibilities and benefits among market and social players are explored [11][12], which ensures that the needs of users are met while enhancing the sense of access and identity of various social groups.

**Under the government-led public-private partnership model, the strong institutional, financial, and public resource support from the government is the footstone and impetus for the efficient regeneration of complex and critical areas.** For regeneration projects that are large in scale, difficult to implement, and have outstanding value for preservation, the government is capable of providing strong policies and implementation guarantees to effectively safeguard public rights and interests, and ensure that the regeneration of core areas tallies with the direction of the whole city's strategic objectives. The National Cultural Heritage Administration set up the Shanghai Yangpu Living Corridor Demonstration Zone for the Protection and Use of Cultural Heritage Resources in this area. The local government established a working group headed by a deputy mayor, to organise regular working meetings. The government's heightened attention brought about a series of innovative policies and preferential resources, which attracted high-quality enterprises and activities and further stimulated the revitalisation of abandoned historic industrial districts.

**The synergy of the city's strategic objectives, regional development planning, and district implementation strategies is an effective driver for efficient regeneration.** The efficient regeneration of the Yangpu Riverfront Historic Industrial District is credited with the top-down design, implementation, and check, and all these aspects are linked with each other and support each other. The *Shanghai Master Plan (2017-2035)* proposes to build Shanghai into an excellent global city, an admirable city of innovation, humanity and sustainability as well as a modern socialist international metropolis. The city also sets up the construction goal of creating a world-class waterfront area in the core area along the 'One River, One Creek', which will be jointly built, governed, and shared by the people. Efforts will be made to promote the development process of historical and cultural preservation, spatial quality improvement, and industrial structure upgrading along the Huangpu River. The planning of the Yangpu Riverfront section will follow the principles of industrial history preservation, ecological restoration, returning the river to the people, and industrial capacity upgrading. The implementation strategies for the regeneration process, such as graded preservation, prioritised connection of public spaces, and the establishment of an online new economy industrial park, will put the aforementioned guiding principles into practice. Thanks to the continuity of urban regeneration performers, leaders, and managers, the government-backed management platform and state-owned development companies effectively responded to the requirements and objectives of the urban development in the regeneration of the Yangpu Riverfront Historic Industrial District. By doing so, the regeneration of the district and urban development can complement each other, enabling the district to gain more resources from the city and in return provide a driving force for the achievement of the city's comprehensive development objectives.

### 3.2 Deficiencies of Yangpu Riverfront Life Cycle Regeneration Management

**The institutions formulated in the early period were not so sound that practical problems such as ownership transfer and new business format introduction at the implementation phase were not comprehensively covered.** Due to China's complex institutional background and the dramatic changes in the political and economic environment over the past hundred years, the urban regeneration system is inevitably insufficient to meet the current complicated demand for regeneration. For example, the administrative measures set up to avoid the loss of state-owned assets and featured by strict control of property rights by government departments, resulted in land use attributes and housing functions restricted to green space and public welfare functions, thus making it difficult for commercial brands to settle in. Besides, it is difficult for the land designated for purely public welfare functions to meet the demand for land use, and the huge volume and capital investment is also a serious challenge confronting the management unit. Currently, Yangpu Riverfront is managed by the state-owned enterprise Shanghai Yangpu Riverfront Urban Operation and Management Co., Ltd (the Company). The buildings, green spaces, squares, and other public spaces in the area, maintained and operated by the Company, are mostly for public welfare purposes. Such a situation has two aspects of drawbacks. On the one hand, it is difficult to manage the area, accompanied by a lack of profit-making methods, and there are also problems such as a lack of commercial activities and supporting services in the green spaces. On the other hand, due to the limitations of the ownership system, it is difficult to introduce market entities, posing a dilemma<sup>1</sup>.

**A smoother connection between each process is needed, with the demand for more synergistic efforts among stake-holders.** Although a multi-party consortium has been formed, there is still inadequate collaboration mechanism and inter-process coherence mechanism. Despite the policy and financial support from government departments, as the main participants, it is difficult to avoid the disadvantages of limited participation of market and social entities and the inability to connect different funding links, which hinders the high-quality and sustainable regeneration. For example, the transfer of property rights of some historical buildings needs to be approved by the government functional departments which, as the construction side of the project, wholly invest financial funds to repair these buildings, and then transfer them to Riverfront Company to introduce the functions, and accordingly carry out the second interior decoration and mechanical and electrical engineering construction. These buildings may even be decorated for the third time after being transferred to the owners. According to the current administrative measures, financial funds are restricted to be used for the renovation of public service historic buildings, and Riverfront Company is not allowed to invest funds and make decisions in the government-led projects. This avoids the loss of state-owned assets such as hidden debts, but the same project can only be rigidly carried out by different entities in various steps, which greatly affects the quality and efficiency of the regeneration.

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<sup>1</sup> The information is sourced from the author's interview with Shanghai Yangpu Riverfront Investment and Development (Group) Co., Ltd.

**The strategy mechanism of check and adjust in the LCM system needs to be improved.** In the process of urban regeneration, more attention is often paid to planning, construction, and operation, as opposed to insufficient attention to the in-process check and the subsequent adjust. More specifically, there is a lack of a testing system and indicator system for the comprehensive spatial, economic, and social benefits of urban regeneration, as well as specialised organisations and convenient feedback channels. Efforts are still needed to explore more channels for check and adjust, expand the coverage of stake-holders involved in check and adjust, and enhance the integrity and sustainability of the LCM system.

#### **4. Conclusions**

Due to increasing resource depletion and dramatic changes in the political and economic landscape, cities worldwide are beset with numerous social, environmental, and economic challenges that necessitate urban regeneration to meet the growing new requirements. The regeneration of historic industrial districts, as an important part of urban regeneration, is a complex system with intertwined multi-dimensions. It involves coordinating efforts and interests of multiple stake-holders, expanding funding sources and maintaining sustainable profitability, balancing historic heritage preservation and future development, and perpetuating the appearance of historic buildings, and maintaining their long-term availability. In view of the complexity and continuity of urban regeneration, this paper proposes the LCM theoretical framework, and makes a case study of the Yangpu Riverfront Historic Industrial District by reviewing its regeneration strategies and dilemmas. The Yangpu Riverfront Historic Industrial District is an important development hub of Yangpu District and even of Shanghai, and innovative LCM concepts and methods will be explored under high standards to build it into a 'world-class waterfront area'.

The process of its regeneration is marked by a relationship of multiple stake-holders offering mutual benefits and checks, the model of strong government participation to guarantee the efficient regeneration of complex critical areas, and the principle of synergistic objectives, planning, and strategies at all levels to enhance the effectiveness of regeneration. However, some problems have still been revealed, the unsound institutions formulated in the early stage are hard to be implemented in the later stage; a smoother connection between each process is needed; and the strategy mechanism of check and adjust needs to be improved. The core dilemma lies in the still imperfect institutional system and still obstructed interconnection between stake-holders. This creates a cascade of impediments to multiple processes in the regeneration cycle, which cannot be fundamentally improved by relying solely on the efforts of a single party or the optimisation of one aspect. Such a situation arises from the profound and complex institutional mechanism in the context of the country's socio-economic development. Therefore, more attention and higher level of regulation and guidance are needed to essentially improve the life cycle governance for the regeneration of historic districts.

Moreover, the effectiveness of the LCM concept and methods is tested. Unfortunately, this study still has some issues to be perfected. For example, experiences and dilemmas of more

international cases need to be collected to enrich the case system so that the case characteristics can be summarised and evaluated more accurately and objectively. These will be the direction of future research.

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