

## On Major Issues and Countermeasures of the Regeneration of Former Industrial Sites in China

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**Abstract.** China is experiencing a fast-speed urbanization, which has brought many social and urban problems such as social exclusion, gentrification and pollution. Urban regeneration has been employed by many countries and regions to solve the problems arising during the urban regeneration, in particular the regeneration of former industrial sites. Many issues such as environmental protection, social inclusion, public participation, infrastructure construction and innovative regeneration forms all have a great impact on the sustainable regeneration of former industrial sites in China. This paper mainly summarizes the major issues of the regeneration of former industrial sites and proposes some countermeasures to the urban regeneration in China. It is expected to provide some useful suggestions to the core stakeholders of the regeneration of former industrial sites.

### Introduction

With the rapid economic development and transformation of industrial structure, many traditional industries, especially the manufacturing industry, are facing a decline or collapse, which will inevitably lead to the emergence of a large number of old industrial buildings in most Chinese cities [1]. The Nizhny Tagil Charter for the Industrial Heritage adopted by the International Committee for the Conservation of the Industrial Heritage defines it as the remains of industrial culture which are of historical, technological, social, architectural or scientific value [2]. In 2006, the State Administration of Cultural Heritage organized the Wuxi Forum on the Conservation of China's Cultural Heritage, focusing on industrial heritage for the first time in China [3]. In the past few decades, most derelict or vacant buildings in the city center have been demolished and redeveloped into commercial or residential buildings, which caused great wastes of resources and couldn't preserve local industrial heritage effectively. In fact, the regeneration and utilization of post-industrial areas can work as a catalyst for urban revitalisation. Although regeneration projects of post-industrial sites in many cities in China are currently striving to promote local economic growth, they do not fully consider regional differences in design and urban planning. Therefore, even if they have made some achievements in retail and entertainment industries, there are still many problems in developing local businesses or meeting local people's demands. The transformation of former industrial buildings is closely related to the development of the local creative economy. Comprehensive research and analysis of local historical heritage, geographical location, trade characteristics, cultural heritage and other factors can help to provide a more effective and sustainable regeneration strategy.

Currently, China is shifting from a factor-driven and investment-driven phase to an innovation-driven and wealth-creating phase of economic development. The overall urban planning and the lack of comprehensive and coordinated regional infrastructure construction have led to many problems such as high levels of unemployment, few job opportunities, high level of crime, derelict land and poor environmental conditions. It is really necessary to promote the economic growth of creative and cultural industries, solve the problems concerning social welfare faced by many cities in China for the large-scale urbanization in the past years, and provide more feasible suggestions for regional economic development. Sustainable urban renewal approach gains strong support from researchers, professionals and government officials worldwide [4, 5]. It would be of great benefit for

the core stakeholders with the decision-making process to summarize the major issues arising from urban renewal and develop a holistic and systematic evaluation model of urban renewal in China based on the characteristics of regional history, geography, culture and customs, etc.

## **Issues Concerning the Regeneration of Industrial Sites**

### **Protection of Industrial Sites and Regeneration Planning**

The protection and renovation schemes for former industrial sites have attracted the attention of the government officials, developers, designers and researchers as well. How to properly develop the existing industrial buildings based on the protection of industrial heritage and realize the transformation of its functions is the key to solving this problem. The successful transformation of the space would improve the vitality of local cultural creative industry. The regeneration of former industrial sites will contribute to the economic benefits of the practitioners in the regeneration area. It can be seen that the transformation of old industrial sites should fully consider the characteristics and conditions of the existing buildings and make a comprehensive protection and transformation plan. The transformation project should also take into account the specific needs of various stakeholders, and play a certain role in building landmarks of the city, developing profitable projects, and building urban cultural leisure space.

### **Environmental Protection and Maintenance Mechanism**

An important part of the regeneration of former industrial buildings lies in the protection and utilization of natural resources. The protection and regeneration of former industrial sites is an environment-friendly measure that is beneficial to the environment. Reusing the derelict factory buildings and warehouses as existing environmental resources can avoid a large amount of waste of resources caused by demolition and reconstruction. In addition, the short reconstruction period and reuse of construction materials can reduce the pollution to a great extent. Too much construction waste is produced annually in China and it is much higher than that of developed countries. Furthermore, the fossil fuel consumed in building and transportation process also brings about an increase in greenhouse gas emissions, while former industrial buildings have strong structural and spatial potentials for further redevelopment, and it is of great significance to transform them. In short, the regeneration of former industrial sites is meaningful to future urban industrial transformation, structural optimization, functional improvement, traffic improvement, environmental protection, and integration of resources.

### **Economic Profits Management**

The regeneration of former industrial sites will help to develop trade, finance, culture, sports, tourism and other fields, and provide corresponding transportation, accommodation facilities, leisure and entertainment space. The reconstruction of former industrial sites can bring direct economic profits, while the sustainable urban regeneration calls for a comprehensive planning of the projects. Regeneration of those dilapidated areas usually has the investment from the government, private sectors, non-governmental organisations, which have various economic and social expectations from these projects. The cultural atmosphere of the regeneration area and the historical significance of its transformation are the main reasons for attracting customers and tourists. For example, a waterfront regeneration project may include commercial yachts, hotels, restaurants, education, clubs and other business categories. Low rents and flexible rent collection method can also reduce the financial burden of the practitioners in these areas. All in all, except for the economic benefits brought by the regeneration, the urban renewal project should consider the local residents, practitioners and other stakeholders' interests.

### **Protection of Industrial Heritage**

The successful regeneration of some former industrial sites can provide valuable experience for other

cities and regions in terms of preserving local history, inheriting regional culture, and improving the city's competitiveness. Industrial heritage is an integral part of human cultural heritage. Cultures of different periods and regions have different characteristics. Urban industrial heritage is different from the cultural heritage in the general sense since they have witnessed the changes of urban development and are the essence of the creativity of the working class. Some industrial heritage sites also reflect the social changes in specific historical periods, and contain important national spirits like indiligence and courage. In addition, many industrial heritage sites are located in the central areas of the city and they influence the overall design and planning of the city in the long-term run. It is very necessary to make use of the comprehensive commercial development model to fully exploit the industrial heritage, give these buildings a new life, focus on the preservation of cultural value and history of industrial heritage, and enhance the social, economic and aesthetic value of these places.

### **Infrastructure and Supporting Services Construction**

The overall planning and construction of infrasture and other supporting services are the requisities for successful regeneration projects. A sustainable urban regeneration project should consider the location, rent, passenger flow, supporting services (such as parking, office facilities) and many other basic facilities. The completeness and effectiveness of the service chain can greatly increase the popularity of the space and attract more practitioners of cultural and creative industries, tourism and leisure industries. Nowadays, high-tech facilities are also widely employed to enhance the convenience and accessibility of the regeneration projects. For example, energy efficiency, clean vehicles, mobility, accessibility all show the degree of infrastructure construction. Therefore, the regeneration of industrial buildings can start from the ethnographic research, then analyse the existing facilities, geographical location, historical significance, population density and value of the regeneration area. Successful infrastructure and supporting services construction lay a solid foundation of sustainbale urban regeneration by bringing economic value to developers and providing high-quality recreational facilities for local residents, and creating new job opportunities.

### **Funds and High-quality Talents**

The regeneration of industrial sites is a long-term and complex process that calls for the communication and cooperation between urban planning officials, designers, developers and other stakeholders. In view of the fact that industrial sites in China are mostly state-owned enterprises, relevant laws and regulations should be followed for the change of property owners. The regeneration of identified industrial heritage can gain the financial support from the national or local government. Funds from different public and private sectors like the government, self-funding organisations form the main financial sources of the regeneration. The regeneration requires the scientific planning, proper transportation system and municipal infrastructure, and harmonious relationship between industrial heritage and the surrounding environment. These initiatives have a great demand for the talents in the field of urban planning, landscape design, architecture, marketing and management. Different from the traditional commercial housing development, the regeneration of industrial sites is closely related to the needs of talents in various industries. Professionals of certain technology, innovative development and management will be urgently needed in the future urban regeneration. However, as for the introduction of talents, there has been a great loss of professionals in second and third-tier cities and it is difficulty for these cities to introduce the professionals they need for the urban redevelopment.

### **Transformation of Laborforce**

With the economic development and upgrading of industry, the transformation of large-scale industrial projects is an inevitable trend of current national economic development, which also accelerates the transformation of some cities from industrial cities to other industries, promote the re-employment of workers in traditional industries, and cause the increasing flow of laborforce to cities. Successful urban regeneration projects will inevitably minimize the negative impact such as pollution, solve certain urban problems, and maximize the positive effect such as the employment

population, innovative spirits and consumption trends. Different regions should actively carry out skill training for the employees according to local specific conditions and actively promote the transformation of workers in traditional industries. On the one hand, some workers can work in the industry; on the other hand, some workers in traditional industries can choose to work in some industries without too many technical requirements such as catering, construction and agriculture. In fact, some derelict areas can be developed into tourism destinations and innovative industrial parks, while others can develop shipping, logistics, other industries based on their local features. These initiatives will create some new job opportunities for the unemployed caused by the regeneration.

### **Cultural and Creative Project Development**

The successful transformation of former industrial areas can influence other cities and regions and further promote the redevelopment of industrial areas in a broad sense. The duplication of some successful regeneration projects at home and abroad has caused many copycat projects in China, in particular the creative and cultural industries. Nowadays, many regeneration practices choose to develop comprehensive creative and cultural parks. Businesses in these projects mainly deal with art, design, artcraft, catering, education, interior design, design consultation and other relevant businesses. It can be seen that many regeneration projects of former industrial sites focus on building creative zones, including cultural and creative industrial parks, tourism, restaurants, museums, exhibition halls and other projects. In a word, the lack of originality of developing creative and cultural industries is not for the long-term development of the regeneration practices.

### **Promotion of Protection of Industrial Heritage**

Most urban regeneration projects in China are concentrated in state-owned cultural and sports venues, cultural and creative industrial parks, and comprehensive commercial districts. The owners of these projects include state institutions, state enterprises and private companies. In the past, industrial buildings were mostly state-owned assets. In the process of asset evaluation and property rights replacement of existing state-owned assets, it is necessary to conduct a general survey and identification of industrial heritage resources, strengthen the degree of protection, and improve publicity and public participation. Local communities' active participation in the decision-making process can enhance the overall result of the regeneration. The most successful regeneration practice depends on the level of the public's satisfaction. The protection of industrial heritage needs the cooperation of different stakeholders. According to the list of industrial heritage issued by national and local authorities, it is necessary to publicize the value of industrial heritage to the masses through news media such as newspapers, television, and the Internet, so that people can fully realize the importance of the protection and reuse of industrial heritage. In addition, some industrial heritage may also belong to some existing enterprises, so the administrative departments need to coordinate and cooperate with them to promote the smooth development of the regeneration.

### **Countermeasures for the Regeneration of Industrial Sites**

#### **Establishing an Industrial Heritage Protection Mechanism**

In the 1950s, western countries took the lead in entering the post-industrialization stage, and traditional industries began to decline. Many countries began to explore the regeneration of former industrial sites and the protection of industrial heritage. In 1973 the Association for Industrial Archaeology (AIA) was founded [6]. In 1978, the International Committee for the Conservation of the Industrial Heritage (TICCIH) was established as a worldwide organization for the promotion of industrial heritage. Since then, western countries have carried out a large number of industrial heritage protection practices. The well-known cases include the protection and redevelopment of the Ruhr area and the London Docklands. In July 2003, the Nizhny Tagil Charter for the Industrial Heritage marked the consensus of many countries around the world on the protection of industrial heritage. Similarly, China has organized the Wuxi Forum and issued the Notice on Strengthening the

Protection of Industrial Heritage in 2006 for the protection of precious industrial heritage. However, many industrial heritages still need to be identified. The problem lies in the systematic classification, evaluation, protection and regeneration of industrial heritage on both national and local levels. All provinces, cities and regions should follow the national guideline and establish relevant laws and regulations based on local conditions. The governments of all levels should increase the scope of industrial heritage evaluation and identification, improve industrial heritage protection mechanism and combine industrial heritage protection with sustainable urban renewal.

### **Recognizing the Value of Industrial Sites**

As an important part of a city or region's cultural heritage and the reflection of the development of the place, industrial heritage is embedded with the achievements of social development, industrial forms and technological innovation. Industrial heritage is the wisdom and essence of local residents and it can reflect the development process of a city or region. The effective protection and development of industrial heritage can help local people recall the history of urban development. It is of great significance for inheriting urban culture, improving the cultural atmosphere of the community, enhancing social inclusion and creating urban public cultural space. Industrial heritage has historical and cultural values because it witnesses the deep impact of industrial activities on the society and people. The redevelopment of industrial heritage into tourist attractions shows the economic and aesthetic value of these places. Through proper publicity and guidance, people will come to realize that protecting industrial sites helps to maintain the local culture and cultural diversity and creativity. The preservation of industrial heritage has special significance for maintaining the historical features of the city, changing the similarity of urban faces, and maintaining urban characteristics. For example, the Beijing 798 Art District was transformed from a state-owned factory into a creative cultural industrial park that integrates contemporary art, cultural industries and architectural design. Based on the purpose of protecting history and recreating history, Qingdao Beer Museum is the only beer museum in China that integrates beer culture, catering, exhibition hall, shopping and entertainment. These successful regeneration projects of industrial sites provide lessons for similar projects across the country and around the world.

### **Effective Protection of Industrial Sites**

In order to stimulate regional economic growth and solve the problems arising from urbanization, many cities in China are carrying out large-scale property investment and construction. Many derelict and vacant industrial buildings that are full of memories of the city were demolished, including some old factories with historical and educational meanings. The protection of urban industrial heritage is a complex issue, and it is necessary to grasp the essence of the protection. Lessons can be drawn from the successful industrial heritage protection and sustainable urban renewal in China and western countries. The potential economic, cultural and social values of industrial sites should be properly developed, since over-exploitation may bring catastrophic losses to human cultural heritage. The regeneration projects that only pursue economic interests and ignore environmental and social benefits will bring a huge loss to the human society [7]. However, the truth is that many cities in China over-exploit land resources and tourism resources in order to promote economic development. In recent years, some provinces, cities and regions have acted positively to national policies and conducted the investigation and protection of industrial heritage. As for the three common modes of urban regeneration – reconstruction, renovation and conservation, industrial sites are categorized into different modes and regenerated accordingly. No matter which mode of transformation is adopted, it is really necessary for the relevant stakeholders to carry out all-round regeneration plans. In a word, the identification, protection and regeneration of industrial sites should be carried out by national and regional levels according to their historical and cultural significance, economic and social value.

### **Innovative Development of Industrial Sites**

More ways of the regeneration of industrial sites should be explored for the sustainable urban renewal. The regeneration without originality and local features will not have competitiveness for the

long-term development. The introduction of regional cultural and historical features will add more vitality to the urban renewal. For example, for those industrial heritage sites with strong historical meanings, it is possible to provide a place for leisure and entertainment for local residents by adding some facilities while preserving most of the existing buildings. The social value brought by such regeneration is far greater than the economic value of building a residential area after demolition. Innovative development of industrial sites can increase the level of sustainability of the regeneration project by including a comprehensive development of economic, social, cultural and historical value of that area. Successful regeneration projects can build landmarks of the city, promote the development of cultural and creative industries, provide guidance for other regeneration projects, and meet the requirements of environmental protection and sustainable development. Such regeneration can also make full use of relevant policies, create full-scale supporting services, and build public service platforms.

### **Building an Evaluation Model of Sustainable Urban Renewal**

To achieve sustainable urban renewal, the expectations of different stakeholder groups in urban renewal should be well understood. Traditionally, community participation has seldom been valued and practiced in urban development in the context of a socialist country where city planning is carried out category in a top-down fashion [8, 9]. During the urban renewal process, local residents who live nearby and attach great affections to this area are greatly influenced by the regeneration and they will be given the right to have their say in the decision-making process. Academics, professionals, consultants and experts doubt the public's ability in giving useful suggestions since they believe that the involvement of the lay public may have a negative impact on the decision-making. The understanding the expectations of different stakeholder groups in urban renewal projects is also useful for building the evaluation model. What's more, a redevelopment project can promote social cohesion and a sense of belonging to the area, and improve the welfare of local residents in addition to improving the physical environment. Therefore, it is really essential to develop an indicator-based assessment model for sustainable urban regeneration, in particular the regeneration of post-industrial sites in China. The assessment model will provide an excellent opportunity to study the social, economic and environmental sustainability of urban regeneration projects and to provide some insights for core stakeholders.

### **Conclusion**

This paper summarizes the major issues concerning environmental protection, social inclusion, public participation, infrastructure construction, innovative regeneration forms and other factors that influence the sustainable regeneration of former industrial sites in China. The regeneration of former industrial sites is a complex process and it requires the cooperation of different stakeholder groups. In order to achieve a high-level sustainable urban renewal, a holistic investigation and protection strategy of industrial heritage needs to be adopted and it is necessary to establish a systematic assessment model of the sustainability of urban renewal based on different urban renewal conditions.

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