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A Study on Community Conservation and Renewal Strategies for Industrial Heritage: Lanzhou City in the First Five-Year Plan Period as an Example

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KEYWORDS

*First Five Years;
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ABSTRACT

The "First Five-Year Plan" is the beginning of China's modern industry, with the development of social economy and industrial transformation, many industrial heritage is facing the problem of renovation and renewal, and its corresponding supporting residential neighbourhoods are also difficult to adapt to the requirements of contemporary residential life, so this paper takes the industrial heritage community in Lanzhou as an example, and based on the summarization of the characteristics of the current situation and problems, discusses its value and explores the protection and renewal strategies for the industrial heritage community. Therefore, this paper takes the industrial heritage community in Lanzhou City as an example, summarises the current characteristics and problems, discusses its value, and explores the protection and renewal strategies for industrial heritage communities.

INTRODUCTION

At the beginning of the founding of New China, in order to restore the national economy as quickly as possible and to raise the living standards of the people, China began to build various kinds of factories and to develop its industry. Especially during the period of "First Five-Year Plan" (1953-1957), 156 key projects supported by the Soviet Union were taken as the core to implement large-scale industrialisation. Lanzhou was one of the eight key cities in the "First Five-Year Plan" period, and among these eight key cities, Lanzhou was the city with relatively more projects arranged in the 156 projects built with the aid of the Soviet Union. Along with the landing of these heavy industries, a large number of workers entered the factories, all kinds of supporting facilities in the city were built one after another, and industrial communities came into being, and

Lanzhou developed rapidly in many aspects such as economy, population, and size of land.

OVERVIEW OF THE INDUSTRIAL HERITAGE COMMUNITY IN LANZHOU

Construction History

The Workers' Settlements were assembled residential communities built nationwide from 1951 to 1978 under the socialist planned economy system to solve the housing problems of the working class. After the construction plan of the state in Lanzhou was determined, a large amount of investment was made in the industrial construction of Lanzhou city, in which 6 out of 156 projects assisted by the Soviet Union were arranged to be constructed in the Lanzhou area, which greatly developed the heavy industry of Lanzhou. During the

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Table 1 | Statistics on the construction scale of Project 156 in Lanzhou during the First Five-Year Plan Period

Sports Event	Lanzhou Refinery	Lanzhou Oil machine shop	Lanzhou Nitrogen Fertiliser Plant	Lanzhou Synthesis rubber factory	Lanzhou Thermal Power Station	Lanzhou Oil Refining and Chemical Machinery Factory
Scale of construction	Refining 1 million tonnes of oil	Petroleum equipment 15,000 tonnes	ammonia 52,000 tonnes	synthetic rubber 15,000 tonnes	100,000 kilowatts	Chemical equipment 25,000 tonnes

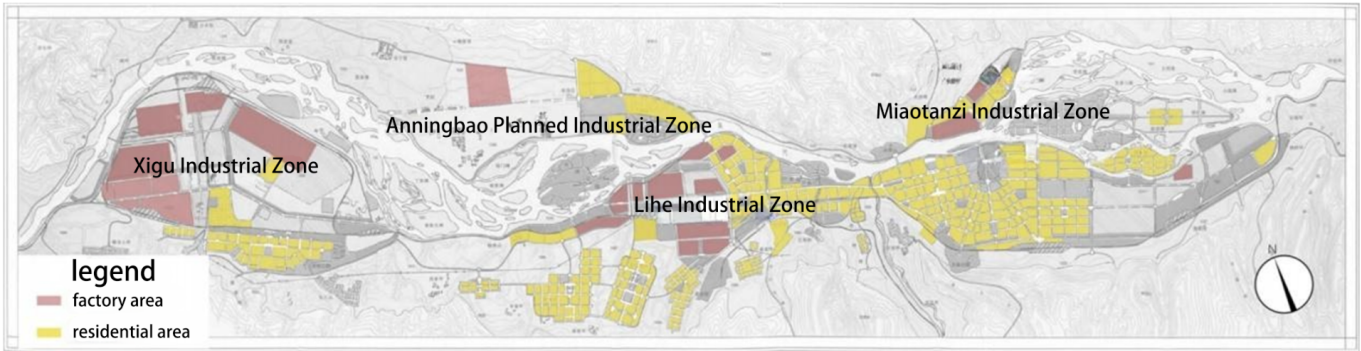


Figure 1 | Spatial structure of industrial and residential land use in Lanzhou in 1954

"First Five-Year Plan" period, the industrial construction with these 6 projects (Table 1) as the cornerstone built Lanzhou into a national petrochemical industry base, and also established Lanzhou as an important petrochemical city at the beginning of the founding of the People's Republic of China, and determined the nature of Lanzhou's city. As the number of industrial enterprises grew, the number of workers also grew rapidly, thus inevitably bringing about the problem of workers' living conditions.

In order to better improve the efficiency of factory production and increase the sense of socialist belonging, a large number of workers' settlements were slowly established in Lanzhou as the supporting housing for workers of factories and enterprises, and most of the workers' settlements in this period were built around the factories and enterprises to which they were attached, and the number of settlements increased with the development of Lanzhou's industrialisation. From this time onwards, industries and settlements in Lanzhou were mainly constructed in four areas in the central city as the core (Figure 1), i.e. Xigu Petrochemical Industrial Zone, Qilihe Mechanical Manufacturing Industrial Zone, Anningbao Planned Industrial Zone, and Miaotanzi Industrial Zone; Chengguan District, as the political and cultural centre of Lanzhou, has gradually downsized the scale of the construction of industrial enterprises in its subsequent planning, and the workers' settlements there are relatively more dispersed. Industrial development outside the centre of the city was relatively small. According to statistics, there were 16 major industrial enterprises built in Lanzhou during the First Five-Year Plan period, with some 40 workers' settlements attached to them.

Spatial Pattern Characteristics

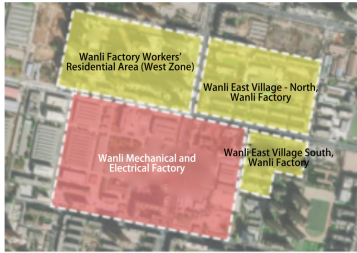
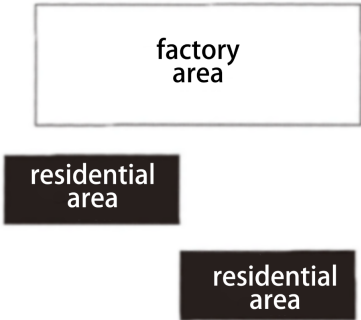
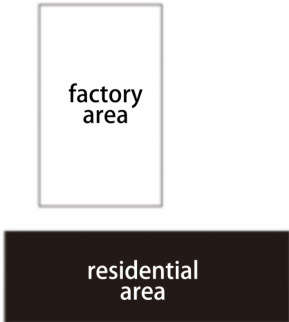
Characteristics of Settlements and Industrial Layouts

Lanzhou workers' settlements and their supporting industrial plants, because they were built under unified historical conditions and backgrounds, and subject to unified planning ideological guidance and socio-economic condition constraints, have a certain degree of convergence in the distribution of industries and their workers' settlements in , which can usually be classified into four basic layout characteristics: enclosing distribution, parallel distribution, vertical distribution and independent existence (Table 2).

Characteristics of the Spatial Form of Industrial Communities

The construction of workers' neighbourhoods in Lanzhou during the First Five-Year Plan period was under the influence of the same socio-economic conditions and unified planning ideology, and the spatial patterns of these neighbourhoods were also convergent. In the construction and renovation of workers' neighbourhoods, most of the original street systems were retained, and the demand for housing was met by adding more floors to the buildings, improving the internal house types and perfecting the public facilities in the neighbourhoods. In addition, in worker neighbourhoods where many units are clustered together, additional residential buildings are constructed in the vicinity according to the needs of the units, instead of being bulldozed and rebuilt. The spatial patterns of workers' settlements can be broadly classified into peripheral neighbourhood, row, mixed and street type.

Table 2 | Classification of characteristics of workers' settlements and industrial distribution in Lanzhou

Diagnostic Property	Schema	Case (law)	Plant Name (of a thing)
wear by wrapping around (scarf, shawl) close work deed ingredient declare			ten thousand Li (surname) pivot electronic factory
metre classifier for objects in rows such as words work deed ingredient declare			surname Lan calcine calcine greasy make into work gather factory
bequeath surname Zhi ingredient declare			surname Lan flying factory
mono sole set up found			surname Lan stone inscription factory worn (with age) sites

Neighbourhood The peripheral neighbourhood style is a layout in which dwellings are arranged along the neighbourhood enclosure to form courtyards, and is also the pattern of Lanzhou workers' settlements influenced by Soviet planning concepts with Soviet characteristics. At present, there are a large number of remnants of this pattern in Lanzhou workers' settlements, such as the Lanlian Dongyuan neighbourhood (**Figure 2**). However, the disadvantages of this layout mode

arising from the direct copying of the Soviet experience without taking into account the differences in the geographical environment have caused problems such as affected ventilation and obstructed lighting.

Determinants Row-type is a building layout in which houses are arranged in parallel according to a certain direction and reasonable spacing, for example, Lanzhou Electromechanical Factory Family House (**Figure 3**). Row layout can not only satisfy the demand



Figure 2 | Spatial form of Lanlian East Garden



Figure 3 | Spatial form of Lanzhou Mechanical and Electrical Factory workers' settlement



Figure 4 | Spatial form of Lanhua 25 block



Figure 5 | Spatial form of the family yard of the current Lan Shi factor

of light and ventilation of the building, but also has low cost and convenient construction, so it can be quickly built and put into use to meet the economic conditions and demand of our country at that time. However, the disadvantage of row and column layout is that the privacy is poor, and the layout lacks of interest, and the spatial form is slightly monotonous.

Hybrid Hybrids are a combination of peripheral neighbourhoods and rows, with relatively enclosed and row-arranged spatial patterns, such as the 25 blocks of Lanhua (Figure 4). "After the First Five-Year Plan, when the shortcomings of the Soviet model and the crisis in Sino-Soviet relations were discovered, China began its own exploration of settlement planning, and then, in combination with its own actual situation, took advantage of the advantages of the peripheral neighbourhood type and the row-row type, and the spatial pattern of mixed-type settlements began to multiply slowly.

Street Style The street-side style is a linear arrangement of dwellings along both sides of a street, which was gradually changed to a pattern of commercial on the ground floor and residential on the upper floors at a later stage, or workers' neighbourhoods that were demolished after the first renovation, leaving only the street-side buildings of the settlement, such as the present Lan Shi factory family compound (Figure 5). In the early 1960s, when the national economy was slowly improving, the street-side layout could better meet the commercial needs of urban residents, and there was also diversity in street facades, which to a certain extent facilitated the lives of residents and increased the vitality of the community.



Figure 6 | Building elevation of Lanzhou locomotive factory settlement

EXISTING PROBLEMS IN THE COMMUNITY AND THE MOTIVATION FOR RENEWAL AND TRANSFORMATION

Status Quo Issues

Disordered Spatial Texture

The spatial fabric of workers' settlements consists of residential buildings, public buildings and activity spaces. Due to the spontaneous development of the workers' neighbourhood, the spatial texture has gradually become disordered. Generally speaking, the area of activity space is slightly larger than the area of buildings, but the contrast between buildings and activity space is slightly weaker. The visual focus of the spatial texture is on the public buildings in the centre, the presence of activity space is poor and the utilisation of the only activity space is weak. The demand for activity space in the workers' neighbourhood is, on the one hand, a supplement to the function of the internal space of the neighbourhood as a place of recreation and entertainment for the residents, and on the other hand, a visual transition and extension of the urban space from the point of view of urban design, so as to make the spatial texture of the workers' neighbourhood and the urban texture form a coherence and consistency.

Disorganised Traffic Structure

Traffic conditions in workers' settlements are generally problematic, as most of the roads in these areas do not have a clear road hierarchy, leading to widespread mixing of vehicles and pedestrians, frequent congestion and traffic safety hazards. In addition, the connectivity of the road network has been severely affected by the insertion of new buildings in the neighbourhoods, making widening and reconstruction of roads more difficult.

This traffic chaos not only affects the efficiency and convenience of residents' travelling, but also brings a series of safety hazards to the settlement, such as traffic accidents and traffic safety problems caused by road congestion. This not only reduces the travelling and vehicular experience of residents, but also adversely affects the quality of life and safety of the residents of the settlements.

Cluttered Use of Functions

The main function of the workers' settlements remains residential, but they also provide public services such as primary schools and municipal facilities. In addition, a number of small commodity economies have sprung up in the area, such as food markets, pubs, pharmacies, hairdressers, retail shops, beef noodle shops and roast lamb stalls. These small businesses are spontaneous and convenient, and are classified into five categories according to their business types: convenience businesses, speciality catering, medical and healthcare, entertainment and leisure, and agricultural and vegetable markets. In addition to serving residents in workers' neighbourhoods, these public services and small businesses also radiate to residents of surrounding cities. Thus, to a certain extent, the small-commodity economy provides convenience to workers' settlements and urban residents, but the overly mixed functional space may undermine the safe, clean and tranquil environment of workers' settlements.

Aging Infrastructure

The infrastructure in Lanzhou's workers' neighbourhoods is dilapidated; for example, in terms of water supply and drainage facilities, there are serious problems of insufficient water supply and leaking pipes, with first-floor residents often worrying about clogged sewers; in terms of winter heating, there are cases of uneven heating from ageing boilers; and in the case of multi-family co-habitation, there are cases of multiple households with multiple meters, which leads to disputes among co-habitees over the distribution of funds for water and electricity. As a result, residents of old housing estates often leave their neighbourhoods because the infrastructure is not up to date.

Dilapidated Buildings

Most of the buildings were constructed in the 1950s and 1960s. Due to their age, they can no longer meet the needs of modern life, and there is a strong demand from the residents to renew their houses. The appearance of the residences has been greatly damaged, with some buildings experiencing peeling siding on the walls and leakage on the roofs. As there is no unified property management, some residents paint the walls themselves or make up for it by repairing themselves with wooden boards, making the buildings lose their original appearance.

Analysis of the Causes of the Current Problem

There are three main reasons for the existing problems in Lanzhou's workers' settlements: firstly, the property rights of the workers' settlements are very complicated, and in the period of housing reform, there were three forms of purchasing housing, namely, standard price, cost price and market price, for transferring

property rights, which resulted in multiple modes of property rights co-existing in the workers' settlements, and led to a variety of property rights problems intertwined within the settlements, making it impossible to get a unified programme for demolition and rehousing; secondly, the relevant governments and units and property developers could not get a perfect answer to the question of the interests of the workers' settlements. Secondly, the relevant governments and units and property developers have not been able to get a perfect answer to the question of the interests of the workers' neighbourhoods in terms of demolition and resettlement; and finally, the interests of the main residents of the workers' neighbourhoods are more complicated, i.e., how much compensation for demolition and resettlement or whether or not there is a substitute for new housing with welfare benefits, and the inability of low-income people to adapt to the cost of living after they have been moved out.

Retrofit Value Analysis

Historical Value

In terms of historical value, many of Lanzhou's industrial heritage are the first enterprises in the industry in the north-west, or the largest enterprises in the country at that time. For example, Lanzhou Chemical Industry Company, founded in 1956, is the first large-scale petrochemical base in China, and is known as the "eldest son of the Republic's petroleum industry". These enterprises themselves have an important position in the history of Lanzhou's industrial development, and are typical representatives of modern industrial development.

Social Values

Industrial heritage also has important social value. These industrial enterprises built after the establishment of the People's Republic of China witnessed important changes in several major historical periods after the establishment of the People's Republic of China, and at the same time played a great role in solving the problems of employment and the education of the children of workers, and had a significant impact on the lives of the workers as well as those of the neighbouring residents. These industrial heritages are the birthplaces of the careers and lives of the groups of workers associated with them, and they hold irreplaceable social sentiments and have important social values.

Scientific and Technological Value

The scientific and technological value of Lanzhou's industrial heritage is mainly manifested in three aspects: the materials and structures of the buildings, the degree of originality and advancement of the crafts; the degree of importance of the influence on industrial technology, architecture, town planning or landscape design; and the representativeness of the craft traditions, craft processes and artificial skills.

Artistic Value

The artistic value of the industrial heritage is reflected in the shape and style of the structures, the artistic characteristics of the region or era, and the amount of aesthetic value generated by industrial production in a

given period. A number of industrial heritage settlements in Lanzhou have Soviet-style buildings, which are of high artistic value. In addition, the artistic value of industrial heritage is also reflected in its products. For example, Lanzhou No. 3 Wool Spinning Factory was once the largest wool worsted spinning enterprise in China, and its main products are worsted wool, tweed and special fabrics, which have a high artistic value. Its main products were worsted wool, tweeds and speciality fabrics, which had high artistic value.

Economic Value

The economic value of industrial heritage in cities is expressed in two ways: one is the reuse value of the structures and the other is the location value of the industrial heritage site. As most of the enterprises are mainly in the petrochemical and equipment manufacturing industries, the characteristics of industrial buildings such as large span, large space, high ceilings and flexible use of internal space make their reuse potential huge. The advantages of location make Lanzhou's industrial heritage have a fairly high economic value of land.

EXPLORATION OF TRANSFORMATION AND RENEWAL STRATEGIES

Principles of Renovation and Renewal

People-Centred

Resident-orientation is the basic principle of upgrading and renewing workers' settlements, which means that this study takes the residents' perspective and always puts their needs and interests at the forefront of the development and construction process. The focus is on addressing the interrelationship between settlement protection and crowd behaviour. Taking the residents as the main component of the settlement environment can restore the reality of their lives and meet their needs. Because of the complexity of the historical and humanistic environment of workers' settlements, there are many things to consider and protect, many of which are non-material and usually difficult to judge from an objective perspective. In order to effectively renew and renovate workers' neighbourhoods, it is necessary to have a deep understanding of the current situation of workers' neighbourhoods as well as the actual needs and thoughts of the workers.

Sustainability

Sustainable development is an important concept in modern community building, and workers' settlements, one of the representatives of old communities, also need to adapt to the trend of the times and pay attention to the issue of sustainability. This is because workers' neighbourhoods have unique ecological and cultural values that should be preserved and developed in the long term. Therefore, if workers' neighbourhoods are to be developed in a sustainable manner, sustainability, including ecological and cultural aspects, must be developed.

Based on this principle, transport in workers' settlements should be simple and environmentally friendly in order to reduce noise, air and water pollution and to

take into account ecology, green space and health. At the same time, the renovation of recreational areas should create unique spaces that cater for the interests of different groups of people and provide natural spaces for communication and interaction. In the renewal process, the unique culture and neighbourhood relationship of workers' settlements should also be taken into account to preserve their unique values and create a harmonious living atmosphere, which will help to achieve sustainable and benign development of the community.

Renovation and Renewal Strategy

Sort Out the Spatial Hierarchy and Clarify the Public Space

When workers' settlements are being upgraded, it is very important to establish a clear spatial hierarchy. Firstly, such a hierarchical structure can integrate dispersed spaces into an orderly system and enhance the sense of wholeness of the settlement, while at the same time assigning different meanings to different types of spaces and improving their recognisability. Secondly, the gradual unfolding of spaces of different scales and levels to form a coherent and comfortable spatial sequence can enhance the interest of the space and enrich the spatial experience of the residents.

In terms of the creation of public space, this can be done by optimising existing public activity space or opening up new public activity space. Reasonably clearing private structures in workers' settlements that seriously affect public activities, optimising small areas of unused open space, redefining the scope of the space, reshaping the spatial landscape and adding elements such as leisure seating, fitness equipment and children's play facilities in order to clarify the function of that space, thereby transforming an otherwise negative space into a positive one.

Optimise Traffic Structure and Consider Age-Friendly Design

Traffic optimisation should be based on the retention of the original community roads and the enhancement of road fluency. The fluidity of roads is reflected in the priority of pedestrians in the spatial system, and the convenience, smoothness and accessibility of spatial roads. Autonomous additions and structures in workers' neighbourhoods are the cause of spatial fragmentation in the neighbourhoods, so in optimising the smoothness of the roads, the first consideration should be to remove the autonomous structures that impede the smoothness; and secondly, for the buildings blocking the space, the form of elevated ground floors or corridors through the buildings should be used to ensure that there is access to the smoothness of the roads.

In addition to this, most of the residents in workers' settlements are middle-aged and elderly people, so it is all the more important to take into account the flatness and accessibility of the road surface in the activity space, and to reduce the number of steps as much as possible, and to set up ramps instead, as well as to take good anti-skid measures. If there is a height difference between indoor and outdoor areas, it is necessary to set up barrier-free wheelchair ramps for mobility, and due consideration should also be given to the installa-

tion of special wheelchair mobility handrails, so as to ensure the safety of wheelchair-bound elderly people in using wheelchairs for mobility walking. Inside settlements, access to facilities where there is a height difference also requires the installation of wheelchair-accessible paths.

Maintain Existing Functions To Increase Community Vitality

It is important to retain the original functions as far as possible in order to preserve the way of life of the existing residents and the continuation of the city's culture. In supplementing and upgrading new functions, consideration must be given to the comprehensiveness and diversity of the spatial functions of the settlement, which is the key to the settlement's ability to maintain the vitality of the neighbourhood over a long period of time. In addition to meeting basic living needs, health protection and social needs should be strengthened to enhance the interest of residents' lives. In addition, on the basis of meeting the needs of various functions, emphasis should be placed on cultivating special functions, and some functions with thematic elements can enhance the influence of the settlement in the city.

Enhancement of Facilities To Ensure Safety of Life

The current infrastructure of Lanzhou workers' settlements mainly suffers from outdated and backward facilities. Modern settlements should have a variety of modern infrastructures that bring great convenience to people, but many industrial heritage neighbourhoods have inadequate infrastructures, such as the lack of necessary gas pipelines. In addition, at present, the power supply and communication facilities in workers' settlements can basically meet the demand for housing, but the overhead cables and poles in the neighbourhoods are exposed on the streets, which not only cause damage to the overall environment of the residential area, but also pose certain safety hazards. Therefore, overhead cables and utility poles should be gradually removed during the renovation process to achieve an overall renovation of power grids, communications and other facilities, so as to meet the daily needs of residents under the premise of ensuring the safety of their lives. Cleaning services should also be set up to provide professional cleaning for the community to ensure the environmental quality of workers' neighbourhoods and provide residents with a healthy and clean living condition.

Beautifying Building Facades and Transforming Residential Spaces

In order to highlight the iconic symbols of the workers' settlements and the culture of the settlements, the colour of the materials used for the exterior walls of the buildings needs to be uniformly controlled. In addition, it is recommended that two- or four-slope sloping roofs be used to reflect the characteristics of traditional northern architecture. New buildings in the surrounding neighbourhood should also echo the typical elements of the workers' settlement to maintain the overall character of the neighbourhood. In terms of architectural detailing, old architectural features such as Soviet-style multi-level gables, round-arched windows and doors, relief decorations and triangular mountain flowers can be bor-

rowed, and promotional decorations reflecting industrial culture can also be added, which can be used to reflect the cohesion of the neighbourhood and to realise the fusion and inheritance of the old and the new buildings in space and time.

In view of the dilapidated, dark and other problems in the hallways of old neighbourhoods, the building improvement focuses on facilitating the daily maintenance and safe use and management of the entrance channel environment, with the goal of creating a clean and comfortable living environment. Lighting facilities are set up and new energy-saving lighting products are used to broaden the residents' view of the corridors.

SUMMARY

The future renewal of industrial heritage communities in Lanzhou should be based on the premise of protecting historical and cultural heritage, and at the same time combining with urban development planning and community needs, transforming and upgrading them into modern communities with unique industrial characteristics. This will require the top-down efforts of the government and enterprises, as well as the bottom-up efforts of social organisations and residents, in order to provide better living conditions and a better living environment for the residents.

Industrial heritage communities are different from ordinary residential areas in that they have both the characteristics of modern settlements and a history and culture that modern settlements do not possess, and they have a unique significance as historical products under the influence of many factors. In the renovation, the spiritual culture of the settlement should be fully re-

spected, and the original neighbourhood network and the reasonable self-built facilities of the residents should be preserved as much as possible. On this basis, the spatial texture, traffic structure and public facilities of the settlement should be optimised, and the spatial functions should be integrated, so as to enhance the diversity and economic efficiency of the settlement.

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