



Malaysia Architectural Journal

Journal homepage:
<https://majournal.my/index.php/maj>
e-ISSN : 2716-6139



Study on Renewal Strategy of Traditional Villages in Beijing Suburbs from the Perspective of Catalytic Effect——A Case Study of Shuiyu Village in Fangshan District

Wen OUYANG^{1*}, Zuozheng SHI², Yujun GUAN³

¹School of Architecture and Urban Planning, Beijing University of Civil Engineering and Architecture, China

²School of Architecture and Urban Planning, Beijing University of Civil Engineering and Architecture, China

³China Enfi Engineering Corporation, China

ARTICLE INFO

Article history:

Received: 30 April 2024

Received in revised form

Accepted: 15 October 2024

Available online: 23 June 2025

Keywords:

Traditional villages of Beijing; Catalytic effect;
Village renewal; Village protection.

ABSTRACT

The countryside represents the eternal noble spirit of the country. Due to the rapid industrialization and urbanization, the mass migration of population has led to the gradual transformation of traditional villages into "hollow villages". From the emergence of "nostalgia" culture to the proposal of "rural revitalization strategy", how to protect and develop traditional villages better has become an important proposition. As we all know, the depression of traditional villages has many reasons involving social structure and economic structure, and only the renewal of architecture and planning can not fundamentally save traditional villages. Therefore, the revival of traditional villages needs a complete and feasible system to provide theoretical support and experience reference. This paper takes traditional villages in the suburbs of Beijing as the research scope, and summarizes the classification, development status and characteristics of them through the research of existing literature and field research. Based on the urban catalyst effect, the paper puts forward the relevant renewal strategy of traditional villages in the suburbs of Beijing, including three core operations: "mining catalyst point", "shaping catalyst media" and "sustaining catalyst effect". Taking the renovation project design of Shuiyu Village in Fangshan District of Beijing as a practical case, the renewal research of traditional village is carried out from two aspects: the construction of material form catalyst and the strengthening of non-material form catalyst. This paper attempts to protect the cultural value, ecological value, economic value and life value of traditional villages by exploring the renewal of traditional villages in the suburbs of Beijing from the perspective of catalyst effect, and provide reference and inspiration for traditional villages in other regions.

^{1*} Wen OUYANG.

E-mail address: ouyangwen@bucea.edu.cn

1. Introduction

Traditional villages, bearing modern and traditional lifestyles, are historical and cultural heritages with authenticity and integrity [1]. However, with the technological revolution and social change, traditional villages are facing the crisis of neglect and destruction. China's emphasis on traditional villages has attracted the attention of all sectors of society and invested a lot of resources for protection and development [2]. In the suburbs of Beijing, there are 21 traditional in the Protection List of Chinese Traditional Villages, forming a unique "traditional village group", which has important research value.

However, the protection and development of traditional villages are faced with great difficulties and choices. Should we focus on conservation or development? Should we pursue "restoring the old as the old" or innovative development [3]? There are many problems and contradictions in traditional villages, and the existing protection strategies may lead to hollowing out and excessive tourism development due to over-protection [4]. Therefore, the renewal and development of traditional villages need to formulate a complete theoretical system and practical experience to guide the implementation.

Catalyst effect plays an important role in urban renewal [5], and the problems faced by traditional village renewal are similar to those in urban renewal. Taking catalyst effect as the breakthrough point, this paper discusses its research connotation and development significance in the traditional villages renewal in Beijing.

2. Catalyst effect is introduced into traditional villages

2.1 Research on urban catalysts

2.1.1 Basic ideas and characteristics of urban catalyst theory

The basic ideas of urban catalyst theory are summarized as follows: catalyst triggers the reaction of existing elements; Catalyst can improve the value of the old element, make it achieve a favorable change and save it [6]; The catalyst reaction is controllable and guided; To obtain a positive catalyst, it is necessary to understand the connotation context and cultural temperament of this region [7]. At the same time, the catalyst reaction is predictable; Catalyst design is step strategic [8]; The overall reaction effect of the product is greater than the sum of the elements, which is the pattern of " $1+1>2$ ". The catalyst element itself is identifiable[9].

The aim of urban catalyst theory is to promote the continuous and gradual reform of urban structure, and its importance lies in the fact that catalyst is not the final product, but an element that can stimulate and guide the subsequent development [10]. Reasonable intervention of catalyst elements can promote the renewal of surrounding areas, guide and stimulate the implantation of new elements or the transformation of old elements, thus forming a larger scale urban renewal and producing a wider range of catalyst effects [11]. The chain reaction of urban catalyst not only improves the appearance of regional environment, but also drives the development of the whole region, reflecting the inherent law of market economy and the driving effect in sociology [12].

2.1.2 Types of urban catalyst theory

(1) Classification according to material properties and forms

Urban catalyst can be divided into material catalyst and non-material catalyst according to material property form. It should be noted here that this paper mainly discusses the catalyst of material form, and there will be less dabble in the catalyst of non-material form [13] (Table 1).

Material form catalyst: including small-scale entities, large buildings, urban open Spaces, architectural groups and valuable landscape elements.

Non-material form catalyst: It is intangible substances that can stimulate or inhibit the development of an area, including government policies, urban events, etc.

Table 1

Material properties and forms

Types	External Form	Effect Characteristics	Examples
Material form catalyst	Material form	The action period is generally short, it is an external form of action, and the scope of action is small	Ancient well, ancient mill, museum, commercial center, etc
Non-material form catalyst	Non-material form	The period of action is generally long, which is an internal form of action with a large range of action	Beijing Olympic Games, Shanghai World Expo, etc

Source: Drawing by the author according to relevant materials

(2) Classification according to external manifestations

According to their forms, urban catalysts can be divided into three types: point catalyst, line catalyst and surface catalyst [14] (Table 2).

Point catalyst: it refers to projects that have catalytic potential to affect the development of the surrounding area.

Linear catalyst: it refers to the linear space in the spatial form, or the linear space in the form of several point catalysts.

Surface catalyst: it refers to a large range of surface space, which can also be composed of multiple point spaces and line spaces.

Table 2

External manifestations

Types	External Form	Effect Characteristics	Examples
Point catalyst	Point	Local action, multiple points cause group reaction	Single building, public space, etc
Line catalyst	Line	Linear action, directional is very strong	Streets, waterfront piers, etc
Surface catalyst	Surface	The influence range is large, and the edge effect is strong	Commercial area, historical building area, etc

Source: Drawing by the author according to relevant materials

2.1.3 Function principle of urban catalyst theory

The principle of urban catalytic effect is to find elements with catalytic potential, build them into catalyst points, implant them into the surrounding areas, and interact with other elements to stimulate the vitality of the lot [15]. When new elements are implanted or old elements are transformed, the interaction, integration and resonance of elements together form a catalyst point with a larger range, affect a larger area, produce a chain reaction in the process of urban development, and promote the progressive renewal of the city [16].

2.2 Feasibility analysis of introducing catalyst effect into traditional village renewal

2.2.1 Deep dilemma of the current renewal of traditional villages

Industrialization and urbanization have led to the decline of traditional villages. In the process, a large number of ancient buildings were demolished, village land was requisitioned for infrastructure construction, and village housing was disorderly expanded, and the land was not well coordinated.

(1) Hollowing-out

The phenomenon of population "hollowing out" in traditional villages is not only affected by urbanization, but also caused by the internal reasons of villages. The industrial structure of the village is single, only the primary industry supports the village economy, and the original industry cannot be combined with modern technology[17], which eventually leads to the decline of the rural economy, the lack of labor force, and the waste of agricultural land.

(2) Disorderly self-built houses

With the development of society, traditional architecture has gradually separated from modern life style[18]. The remote location and inconvenient transportation have led to the slow development of the village and the serious aging of traditional buildings. In order to improve the living conditions, the villagers spontaneously rebuilt the village, resulting in serious damage to the original style of the village, which has caused irreversible damage.

(3) Excessive tourism development

Excessive tourism development and simple imitation of urban planning have caused villages to lose their authenticity. Large-scale reconstruction leads to the loss of the uniqueness and historical and cultural value of the villages, and the rural construction of the real estate development mode leads to the disruption of the life of the original villagers and the occupation of the villages by outsiders.

(4) Unreasonable management mechanism and protection consciousness

The extreme unreasonable government management and the lack of protection consciousness of the people are one of the main reasons for the deterioration of traditional villages [19]. The absence of professional departments leads to the disconnection between conservation practice and theory. The lack of technical guidance and effective management leads to blind conservation efforts, which in turn leads to the destruction of historic buildings before they can be preserved.

2.2.2 Feasibility of introducing catalyst effect into traditional village renewal

The renewal of traditional villages is faced with many dilemmas, and the solution of complex problems should not only be limited to the surface, but should be deeply explored. The principle characteristics of catalyst effect are highly matched with the deep predicament of traditional villages. Therefore, it is feasible to introduce it into village renewal.

(1) The system level of "catalyst" - aiming at the problem of the decline of traditional village functions

The lack of a holistic perspective in the renewal of traditional villages leads to functional decline and destruction of ancient buildings. Catalyst effect affects the whole village environment from the system level and provides system services. Therefore, the update based on catalyst theory can carry out functional replacement from the whole point of view and establish an organic circulation system.

(2) The overall correlation of "catalyst" -- aiming at the problem that the spatial form of traditional villages is too isolated

Even after the renewal of traditional villages, the new buildings still have a single function, resulting in estrangement between internal and external relations, forming an "island" phenomenon. The overall correlation of catalyst effect can affect the surrounding buildings and Spaces, make the whole village become the catalyst point, gradually modify the spatial form, and promote the formation of traditional village pattern.

(3) The continuity of the context of "catalyst" -- aiming at the problem of the breakdown of the historical and cultural inheritance of traditional villages

The decline of traditional villages leads to the loss of culture and the breakdown of context. The pursuit of economic value of large-scale transformation brings the result of homogenization. The gradual renewal of the catalyst effect can combine the local history and culture, maintain the dynamic nature, inherit the context, and retain the unique style of the village.

(4) A small amount of locality of "catalyst" - aiming at the problem of over-development of traditional villages

Village renewal is mostly dominated by villagers' independent construction or developers, which easily leads to disorderly development or commercial development. The local intervention of catalyst reaction can gradually affect the surrounding area, gradually control the pace and scale of renewal, and retain the village style.

2.3 Application of traditional village renewal theory based on catalyst effect theory

2.3.1 Catalyst principle of traditional village renewal

The traditional village renewal under the guidance of catalyst theory emphasizes the principles of wholeness, diversity, dynamic evolution and sustainability. The update focuses on overall control and the needs of various social classes, taking into account individuation and diversification. Through a sustainable "chain reaction" in stages, mild protection and activation are carried out to promote cultural inheritance, social development and ecological sustainability. The renewal under this mode can not only continue the historical context, but also continue to update the material environment of the village, gradually improve the ecological environment, and provide a living environment suitable for living, production and tourism[20].

2.3.2 Catalyst elements of traditional village renewal

Only by fully exploring the catalyst elements of traditional villages and fundamentally understanding their intrinsic properties, can we build a relationship with the subsequent catalyst reactions. Based on the analysis of the current situation of traditional villages, five catalyst elements are summarized, which are cultural elements, land use function elements, architectural entity elements, spatial elements and landscape elements (Table 3).

(1) Cultural elements

Explicit context: the structure and spatial layout are the external expression of context and the historical symbol of the village; The public space embodies the production and living habits of the village and is the carrier of Chinese agricultural civilization.

Implicit context: the invisible context of traditional villages includes intangible cultural heritage, farming culture and regional culture, which jointly reflect the spiritual connotation of villages.

(2) Land use function elements

Primary function: The primary function of a village is the basic function of living and agricultural production, because its primary function is single and fixed, so this element is often lacking in vitality.

Dependent function: The subordinate function in the village is related to other industrial functions of its development and is a supplement to the primary function.

(3) Architectural entity elements

Buildings: buildings in traditional villages can be used as solid catalyst elements of buildings and belong to the category of point catalyst, which also reflects the development process of agricultural civilization.

Structures: the structures in traditional villages are indispensable elements to reflect the village customs and historical background.

(4) Spatial elements

Road space elements: it connects the building, landscape and other elements in the village, and can actively stitch all elements of the village together organically.

Node space elements: the reconstruction of node space can combine the villagers' living habits, production mode and historical context.

(5) Landscape elements

Natural landscape elements: They are the elements that fundamentally determine the spatial form and geographical attributes of traditional villages by topography, and are also the primary conditions for the location of traditional villages.

Artificial landscape elements: the artificial landscape elements in traditional villages are quite different from those in cities, which are mostly related to history and culture, and have regional and strong identifiability.

Table3

Classification of catalyst elements

Catalyst Elements	Classification Basis	Types	Examples
Cultural elements	It is cited that A.L.Kroeber and D. Kroekhohn, American anthropologists of human culture, divide the form of cultural expression	Explicit context	Ancient buildings, public Spaces, landscapes, etc
		Implicit contex	Intangible cultural heritage, farming culture, regional culture, etc
Land use function elements	According to Jane Jacobs' classification criteria of urban functional elements, the village catalytic functional elements are classified	Primary function	Residential function, agricultural production, etc
		Dependent function	Tertiary industry, leisure, entertainment, etc
Architectural entity elements	/	Buildings	Folk houses, temples, ancestral halls, warehouses, ancient stage, religious and cultural buildings, etc
		Structures	Ancient grinding, ancient well, carving, archway, road pavilion and so on
Spatial elements	Based on the concept of space in "The Image of The City", this paper analyzes the catalyst space elements in traditional villages	Road space elements	The main road of traffic and the street space of life in the village
		Node space elements	The entrance space of the village, the living and production site, the village square, etc
Landscape elements	/	Natural landscape elements	Hills, rivers, lakes, ancient trees, streams and so on
		Artificial landscape elements	Farmlands, fish ponds, terraces, village pieces, structures, etc

Source: Drawing by the author according to relevant materials

3. Methodology

3.1 Catalytic research methods in traditional villages

Guided by the theories of revitalization, activation, utilization, protection and development of traditional villages, the research introduces the renewal concept of catalyst effect, and utilizes research methods such as literature analysis, historical research, investigation analysis, and induction analysis to organically combine theoretical analysis with design ideas.

Literature analysis: consult books and local Chronicles to understand the research status at home and abroad, and clarify the application of catalyst theory in the study of traditional villages in the suburbs of Beijing to lay a theoretical foundation for the study.

Historical research: based on historical maps and historical records, the paper analyzes the historical characteristics and evolution process of the elements, studies the deep connotation of culture, religion and social structure, and provides theoretical support for the research.

Investigation analysis: through field survey, photo taking, collection of relevant materials and other activities, to understand the current characteristics and development of traditional villages in the suburbs of Beijing.

Induction analysis: collect and sort out the research data and the results of related fields, conduct in-depth analysis of the research content, and serve as the basis for research demonstration.

3.2 Catalytic application methods in traditional villages

In this study, the application mechanism of catalyst theory includes three steps: mining the original catalyst point, shaping the catalyst medium and sustaining the catalyst effect. Design the catalyst application strategy of traditional village renewal based on three steps. The first strategy is to excavate the connotation of architectural entities, public Spaces and hidden contexts according to the specific

conditions of traditional villages, and make them serve as the original catalyst points. The second strategy is to find some catalyst potential points, recycling traditional architecture, spatial integration, construction of composite landscape, etc., to create an active and effective catalyst media; The third strategy is to guide the positive reaction of the subsequent catalyst reaction through the strategy of sustained catalyst effect, such as catalyst elastic design, catalyst follow-up reaction guidance and extension of the surrounding catalyst connection, and promote cohesion and attract people through soft catalyst and other elements, further expand the influence of catalyst points and catalyst media, and promote the renewal of traditional villages (Figure 1).

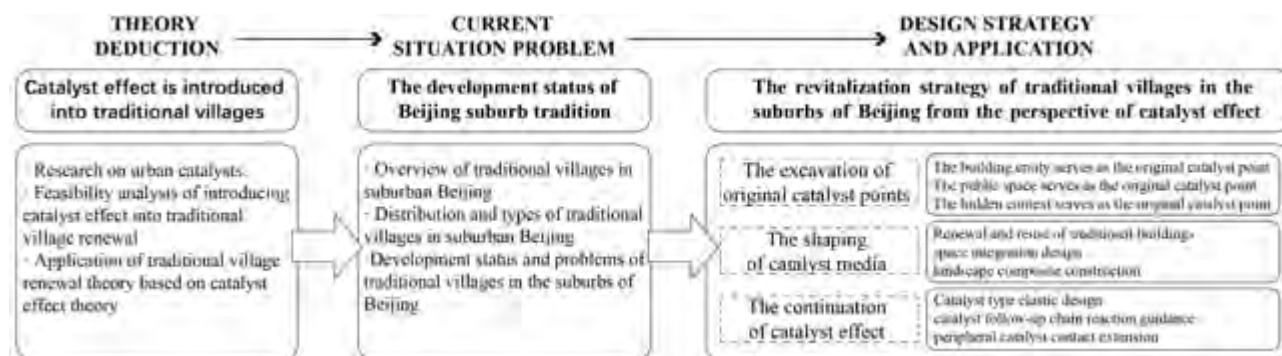


Fig. 1. Catalytic application mechanism of traditional village renewal

Source: Drawing by the author

4. Renewal strategy of traditional villages in suburban Beijing from the perspective of catalyst effect

4.1 Overview of traditional villages in suburban Beijing

As the capital of China, Beijing has long influenced the development of villages in the suburbs of Beijing, and its urban construction, politics, economy and culture have an important impact on villages. Due to their unique geographical location, villages in the suburbs of Beijing were once the migrations of Nuzhen, Khitan, Mongolian, Manchu and other ethnic minorities. Most of them were built in the Ming and Qing Dynasties, and some even have a long history of more than 1,000 years [21].

There are more than 60 traditional villages in the suburbs of Beijing, most of which are concentrated in the west of Beijing. According to the list of traditional villages published by the Ministry of Housing and Urban-Rural Development, there are 21 in the suburbs of Beijing, 12 in Mentougou district, 3 in Fangshan district, 3 in Miyun district, and 1 each in Shunyi district, Yanqing and Changping district (Table 4). The causes of these villages are complex and diverse, some are formed by mountain passes, some by rivers, lakes, springs and canals, some by immigrants, some by garrison barracks, some by traffic roads, some by temples and tombs, some by the development of products, and some by horse pastures [22] (Figure 2).

Table 4

List of Traditional Chinese Villages in Beijing

Batch	Number	Villages
First batch	9	Liuliqu village, Longquan town, Mentougou district Sanjiadian village, Longquan town, Mentougou district Cuandixia village, Zhaitang town, Mentougou district Huanglingxi village, Zhaitang town, Mentougou district Lingshui village, Zhaitang town, Mentougou district Weizishui village, Yanji tow, Mentougou district n Shuiyu village, Nanjiao township, Fangshan district Jiaozhuanghu village, Longwantun town, Shunyi district Chadao village, Badaling town, Yanqing district

Second batch	4	Qianjuntai village, Datai street, Mentougou district Malan village, Zhaitang town, Mentougou district Jijiaying village, Xinchengzi town, Miyun district Changyucheng village, Liumu town, Changping district
Third batch	3	Jieshi village, Yanchi town, Mentougou district Yanhecheng village, Zhaitang town, Mentougou district Gubeikou village, Gubeikou town, Miyun district
Fourth batch	5	Xihulin village, Zhaitang town, Mentougou district Dongshiguyan village, Wangping town, Mentougou district Nanjiao village, Nanjiao township, Fangshan district Baoshui village, Puwa township, Fangshan district Lingong village, Taishitun town, Miyun district

Source: Drawing by the author according to relevant materials



Fig. 2. Distribution map of traditional villages in Beijing

Source: Drawing by the author

The intangible cultural heritage of traditional villages in Beijing area is very rich. In the first, second and third batches of Beijing level intangible cultural heritage list announced by the government, there are 66 intangible cultural heritage items of traditional villages, accounting for 38.8% of the total number of Beijing level intangible cultural heritage, and the heritage value is relatively high. The categories include folk music, dance, literature, folklore, fine arts, traditional handicrafts, traditional medicine and other categories [23]. The village culture and intangible cultural heritage in Beijing have witnessed the historical development of Beijing and are precious cultural resources that should be inherited and carried forward.

4.2 Distribution and types of traditional villages in suburban Beijing

4.2.1 Distribution of traditional villages

The distribution of traditional villages in the suburbs of Beijing can be summarized by combining the situation of Beijing and field investigation. The traditional villages are scattered and mostly distributed in the western suburbs. In this study, traditional villages in the suburbs of Beijing are divided into two categories according to the straight-line distance between villages and Tian 'anmen Square: traditional villages in the suburbs and traditional villages in the suburbs (Figure 3).



Fig. 3. Distribution map of villages in the far and near suburbs of Beijing

Source: Drawing by the author

The geographical location of suburban villages is different from that of exurbs, resulting in differences in natural environment, terrain, climate, hydrology, traffic, etc. Due to the different distance from the urban center, the different village functions also lead to the hierarchical differences of remote and exurbs (Table 5).

Table 5

Features of suburb villages in Beijing

Types	Classification Basis	Development Scale	Distribution Quantity	Essential Feature
Suburb villages	Villages within a radius of 50 kilometers from Tiananmen Square	Large	Relatively many	The village construction site is selected according to the trend of mountains and rivers, mostly in the "north slope of the south", following the concept of "harmony between nature and man", the formation and development of villages are closely related to the functions of the ancient capital of Beijing, and have their unique geographical and cultural characteristics because of the influence of the ancient capital.
Exurban villages	Villages within a radius of 50 to 120 kilometers from Tiananmen Square	Small	Relatively few	Villages are distributed along the traffic lines or in areas with historical functions. Influenced by the culture of border garrison, villages show the characteristics of fortress. Most of the traditional villages in the western mountainous area have the function of ancient commercial connection, distributed along the ancient trade road and influenced by Shanxi. These villages are usually arranged according to the mountain, with strong natural defense capabilities and flexible and free architectural layout.

Source: Drawing by the author





4.2.2 Types of traditional villages





According to the formation reasons and characteristics of ancient villages in Beijing, they can be divided into three types: natural settlement type, traffic road type and fortress type along the Great

Wall. The natural settlement type can be divided into mountain type, plain type and waterfront type. The type along the main road can be divided into post station to drive village development, palace to drive village development, and business service facilities to drive village development. The fortresses along the Great Wall are divided into Guancheng type, Dunbao type, Yingcheng type and Weisuo type. There are three categories and ten subcategories in total (Table 6).

Table 6

Comparison of spatial distribution of traditional villages in Beijing

Main category	Secondary category	Classification Basis			Typical Village
		Dominant cause	Spatial Orientation and Morphological Characteristics	Integrity	
Natural settlements	Monticola	Spontaneously built by fleeing farmers or displaced people	Small scale, mostly distributed in high mountainous areas, limited by terrain, flexible distribution, hash ribbon distribution	High integrity	 Taopeng village, Pinggu district
	Plains	Favorable farming conditions drive development	The scale is large, the plane layout is more regular, roughly round, square, mostly centralized layout form	Medium integrity	 Yanggezhuang village, Shunyi district
	Littoralia	Favorable farming conditions drive development	Large scale, mostly distributed in Chaohe, Baihe old road condition platform and waterfront area, mostly in a beaded distribution	High integrity	 Bangheyan Village, Miyun District
Along traffic arrangement	Post drive village development class	Post route	Near the post, it is mostly banded	Low integrity	 Daodekeng village, Huairou District ; Gubeikou village, Miyun District

	Palace drive village development category	Royal tour route	Near the palace, mostly in ribbon form	Low integrity	Liujiazhuang Village, Miyun District
	Business service facilities drive village development	Beijing-hangzhou Grand Canal and its transport route	Near the dock, mostly in ribbon form	Low integrity	Huangmuchang village, Tongzhou district
Forts along the Great Wall	Guancheng	Military works	Most of them are located in important jurisdictions, the largest number, and the circumference of the castle is mostly 240m-350m	Medium integrity	 Xiaokouchengbao village, Miyun district
	Moundfords	Military works	It has both alarm desk and fortress functions, and the perimeter of the castle is 350-1000m	Medium integrity	 gujiaying village, Yaoqiaoyu village, Yaoziyu village, Miyun District
	Yingcheng	Military works	There are cross streets in the city, schools and fields outside the city, and the perimeter length of the castle is 1000m-2000m	Medium integrity	 Caojialu village, Miyun District; Huanghuacheng village, Huairou district
	Weisuo	Military works	The size is equivalent to the county town, and the circumference of the castle is usually 3000m-4000m	Medium integrity	 Bohai village, Huairou District

Source: Drawing by the author according to relevant materials

4.2.3 Value of traditional villages

Along with the development of the ancient capital, traditional villages in Beijing have possessed profound historical and cultural connotations from ancient times to the present. The architectural forms, building materials, construction methods, structures, customs, customs, etc. inside the villages all reflect the cultural heritage characteristics of the development of Beijing and North China in another

way. It is incomplete to ignore the value study of traditional villages and only study Beijing [24].

Traditional villages in the suburbs of Beijing contain rich historical and cultural values and are an indispensable part of the long history of our country. As material cultural heritage, ancient buildings, historic sites and intangible cultural heritage inheritance, such as ancestral halls, ancient temples, residential houses, opera stages, etc., have important status in Beijing. At the same time, traditional villages also have important social and economic value, and their tourism development potential is increasingly prominent, attracting urban residents to experience traditional culture and spend leisure time [25]. In addition, traditional villages also have important scientific research value, and their layout, architectural forms, features and features reflect rich traditional culture and local characteristics, which are of great significance to connect the history and culture of the whole Beijing area, and promote academic research and cultural inheritance [26].

4.3 Development status and problems of traditional villages in the suburbs of Beijing

4.3.1 Development status of traditional villages

Traditional villages and tourism in the Beijing area have been successfully combined, and a series of tourism projects have been developed in Yanqing District, Pinggu District, Changping District and other places, such as the "Four Season Flower Sea", "Peach picking Garden", "Strawberry Festival" and "ecological picking garden". These projects are based on the tourism strategy of "one village, one product", and the tourism development has achieved remarkable results. The establishment of folk villages and folk households, the development of characteristic tourist routes and the rise of eco-tourism all make rural tourism become increasingly mature. The tourism projects covering orchard picking, the Great Wall culture, the International fair and other aspects have gradually formed a unique "Beijing model".

4.3.2 Problems faced by traditional villages

There are many problems in the development and protection of traditional villages in the suburbs of Beijing. At present, the development situation of each traditional village is different, the destruction situation is also different, and the development situation such as government support and public enthusiasm is also different.

(1) The scale of industrial development is large, and the traditional village style is destroyed

The poor management in the period of the development of traditional villages in the suburbs of Beijing led to the over-commercialization of villages. For example, excessive commercialization has led to the expansion of Cuandixia Village in Zhaitang Town of Mentougou District, destroying the village's appearance. Lingshui Village increased the number of tourists due to the popularity, but improper regulation led to the imbalance of exhibition. Liugou Village in Yanqing District is famous for its special catering, but due to the lack of attraction and the low level of service, tourists have a large mobility.

(2) The process of industrial development is stalled, and the village style remains good

Some traditional villages in the suburbs of Beijing are well preserved and have rich historical buildings. However, the lack of industrial development and the low income of villagers have led to the stagnation of village development. For example, Shuiyu Village and Nanjiao Village in Fangshan District have a long history, ancient trade road and other historical elements, traditional buildings are well preserved, but due to long-term disrepair and lack of infrastructure, the condition is deteriorating. Traditional villages need to strike a balance between industrial development and cultural protection to achieve common development.

5. The revitalization strategy of of Beijing traditional villages from the perspective of catalyst effect

5.1 Research and problem analysis of Shuiyu Village

5.1.1 Location analysis

Shuiyu Village is located in Nanjiao Township, Fangshan District, west of Beijing. It is a remote village in southwest Beijing, about 80km away from the center. It has an area of 846 hectares, 622 households and a population of 1048. There are several large families in the villag, but there are problems of hollowing out such as empty houses and population loss. Village traffic is not convenient, 8 kilometers away from National Highway 108, Nanjiao Township government 1.8 kilometers. The village is located on “The JingXi Ancient Environment”(the historical and cultural corridor in the west of Beijing) and is an important part of The Fangshan Cultural Route. The terrain is high in the southwest, low in the northeast, 500-800m above sea level, with Wells and reservoirs, but some streams have dried up. The village is surrounded by mountains, beautiful scenery and good natural ecology (Figure 4).



Fig. 4. Location of Shuiyu Village

Source: Drawing by the author

5.1.2 Historical context

Shuiyu Village is one of the few existing traditional ancient villages with high historical and cultural value in the west of Beijing, one of the five famous Chinese historical and cultural villages in Beijing, and one of the 21 Chinese traditional villages. According to literature records, Shuiyu Village has been built for more than 600 years, which can be roughly divided into five stages: "incubation period - origin period - flourishing period - decline period - transformation period in the development period" (Figure 5).



Fig. 5. Historical context of Shuiyu Village
Source: The author repainted according to relevant data

Shuiyu Village has rich historical and cultural remains, such as former residences of celebrities, ancient private schools and so on. At the same time, the exquisite brick carvings on the existing houses and the small poems on the stone slabs along the street all reflect its profound cultural heritage and the plot of learning (Figure 6). Shuiyu Village is a unique carrier of multi-cultural integration in ancient northern areas, a typical representative of the continuation of the comprehensive cultural system and production and life system of ancient northern villages, and one of the bases for revolutionary activities and anti-Japanese activities in the western Beijing Mountain area (Table 7).



Fig. 6. Exquisite engravings and prints of Shuiyu Village
Source: Photos by the author

Table 7
Multi-level connotation system in Shuiyu village

Development Phase	Value Characteristics			
	Cultural Accumulation	Village Construction	Production and Living	Red Culture
Gestation period (before Yuan Dynasty)		Mountains and rivers are beautiful	The beginning of the ancient road	
Origin period (Late Yuan and early Ming - early Qing)	Shanxi immigrants The beginning of the village	Feng shui culture Village site selection	Deep mountain village Production and life	
Flourishing period (Mid-Qing Dynasty - early Republic of China)	cultural fusion		Folk flower party Religious culture Business travel trade Coal resources	
Decline period (Republic of China - 2008)				Resistance against Japanese Aggression activities Revolutionary activity

Source: Drawing by the author according to relevant materials

5.1.3 Status of village-shaped landform

Shuiyu Village is located in the southwest of Nanjiao Township, which is a traditional village in deep mountainous area. There are gully landforms with "cellar" shape in Nanjiao area, and Shuiyu Village is formed in Shuiyu gully, which is the necessary condition for ancestors to build a village in this site. Located on the east and west sides of the valley, slightly triangular, surrounded by mountains, the terrain is high in the southwest and low in the northeast, and a reservoir is built outside the village (Figure 7).



Fig. 7. Landscape of Shuiyu Village
Source: Drawing by the author

Shuiyu Village is divided into new village and old village. The old village is divided into East Street and West Street, where many of the ancient buildings have fallen into disrepair, so villagers mostly move to the new village spontaneously built on the north side to live. The architectural forms of the new village and the old village are not coordinated (Figure 8). Shuiyu Village takes the "S-shaped" ancient commercial road and water system of Nanling as the cross-axis spatial pattern, and combines the village layout form of natural terrain to present the shape of Yin-Yang fish, reflecting the construction idea of "depending on the mountain" in the ancient northern mountain village.



Fig. 8. Relationship between new and old villages of Shuiyu Village, water system, ancient business road, and bagua layout of Shuiyu Village
Source: Drawing by the author

5.1.4 Social and economic status

Shuiyu Village used to rely on coal mining as its main economic source, but the village's economy suffered after the government closed small coal mines in 2006. Most of the villagers go out to work, leading to the hollowing out of the village. At present, the village ecological agriculture and forest and fruit industry dominate, due to the lack of government support, low participation of villagers, cultural tourism industry transformation is difficult. Village collective income mainly relies on financial allocation, self-development income accounts for less than 10%, and the per capita income of villagers is low.

5.1.5 Status Problem

The traffic condition of Shuiyu village is poor, the service level of public facilities is limited, the construction of infrastructure is imperfect, and the convenience of life is low. The industrial structure of the village is single, mainly relying on agriculture and forestry. The historic buildings are aging and some have been abandoned. The new houses are not in harmony with the traditional buildings and ruin the appearance of the village. The village is located deep in the mountains, and the transportation is not convenient, which limits the economic development (Figure 9).



Fig. 9. Old house in Shuiyu Village
Source: Photos by the author

5.2 Excavation of the original catalyst point in Shuiyu Village

Through the success of demonstration projects, the vitality of a wider range of villages can be stimulated, people's traditional concepts can be changed, and the protection and inheritance of traditional cultural heritage can be promoted [27]. To make traditional villages more suitable for people to live in, it is necessary to fundamentally revive traditional villages and stimulate their vitality. The establishment of demonstration projects should make full use of the existing resources, dig deep into their connotation, integrate culture, industry, material environment and economic resources, reflect the value characteristics of traditional villages, and realize industrial economic revival and culture inheritance.

5.2.1 Building entity as the original catalyst point

(1) Potential analysis of building solid catalyst elements

Shuiyu Village has preserved many ancient buildings with high historical and cultural value, with

a total of 116 historical buildings, including district preservation buildings such as Niangniang Temple and cultural relics such as Yangjia Compound, Wang Compound and Deshan Hall (Figure 10). Most of the buildings are left over from the early Qing and late Ming dynasties and are influenced by the style of Shanxi-house. Local stone and unique SLATE tiles are mostly used in residential buildings, and a mixture of coal and soil is used for wall plastering [28]. These buildings have great historical and cultural value and can be used as catalyst points [29].



Fig. 10. Distribution map of historical buildings in Shuiyu Village
Source: Drawn by the author

(2) Shaping of the original catalyst point of the entity

Deshan Hall and Wuliu Hall, as the original catalyst points, are transformed into historical and cultural exhibition areas and non-body inspection interactive areas, carrying more public activities and triggering positive catalyst effects. In order to preserve the Qing Dynasty courtyard well, Deshan Hall respects the original courtyard layout and repairs the damaged buildings. The internal function of Deshan Hall is replaced with a historical display (Figure 11), and the function of Wuliu Hall is replaced with a non-body examination interactive area (Figure 12). Both additions are constructed with a modern steel frame system and a timber frame structure, providing a strong contrast to the original building and increasing the infiltration link between the building and the courtyard (Figure 13-14).



Fig. 11. Reconstruction steps of Deshan Hall
Source: Shuiyu Village project team



Fig. 12. Steps of Wuliutang renovation
Source: Shuiyu Village project team



Fig. 13. Transformation renderings of Deshan Hall and Wuliu Hall
Source: Shuiyu Village project team



Fig. 14. Renovation plan of Deshan Hall and Wuliu Hall
Source: Shuiyu Village project team

5.2.2 Public space as the original catalyst point

(1) Potential analysis of catalyst elements in public space

The public space of Shuiyu Village mainly includes squares, streets and so on. Nanling ancient trade Road runs through the whole village, with 5 ancient streets and 2 ancient rivers, forming the skeleton of the village. The ancient commercial road can be divided into 5 sections (Figure 15), among which the East Street branch lane is 213m long and paved with broken slabs. The north section of East Street is 349m long, the south section of East Street is 327m long and the West Street is 137m long.

All three streets are main streets. The West Street branch lane is 197m long and is a branch lane. The square in the village is divided into two types: traffic distribution type and life type, which are used for parking, tourist evacuation and daily.



Fig. 15. Location of historic streets and ancient rivers
Source: Drawing by the author

(2) Shaping of the original catalyst points of public space

Through planting suitable scale landscape pieces to form a space conducive to people's gathering, the distribution space at the entrance of the commercial corridor is transformed. At the same time, people can experience the characteristics of Shuiyu Village in winter, enhance people's participation, arouse villagers' pride, interact with Deshan Hall and Wuliu Hall to form a wider range of catalyst points, stimulate the sustainable development of the surrounding area (Figure 16).



Fig. 16. Public space renovation plan and effect
Source: Shuiyu Village project team

5.2.3 Original catalyst point mining of historical elements

The "Four ancient cultures" represented by ancient houses, ancient rollers, ancient trade roads and ancient Zhongvira in Shuiyu Village show its profound cultural heritage. The village preserves the rich historical sites of the Ming and Qing dynasties, there are 128 Pangu grinding in the village, brick carvings and other cultural relics can be seen everywhere (Table 8). The combination of historical culture and creative industries will promote the development of the village's tertiary industry to activate the vitality of the village.

Table 8

List of remains of Ming and Qing Dynasties in Shuiyu Village

Name	Age
Nanling ancient trade Road	Ming and Qing Dynasties
128 Pangea stone rolling	It began in the reign of Kangxi in Qing Dynasty
Dongweng Bridge	Qianlong period of Qing Dynasty
Xiweng Bridge	Qianlong period of Qing Dynasty
Ancient pagoda Tree	Ming dynasty
ancient ginkgo tree	Ming dynasty
Ancient wall	Ming and Qing Dynasties
Luoguo Bridge	Kangxi period of Qing Dynasty
Yuanyang Well	Kangxi period of Qing Dynasty
Male and female flume	Kangxi period of Qing Dynasty
147 quasi-protected trees	\

Source: Drawing by the author

5.3 Shaping of catalyst media in Shuiyu Village

Shaping the catalyst media is the key in the catalyst reaction design, only successfully shaped the catalyst media, the catalyst point can play a greater role. Through the spatial organization of the level and spatial distribution of the original catalyst points, the catalyst media can further play a role and establish positive relations and interactions with the catalyst points. In this way, various catalyst elements in traditional villages can integrate and resonate, forming a larger catalyst effect and affecting a wider range [30].

5.3.1 Renewal and reuse of traditional buildings

Although the potential of ancient buildings in traditional villages is limited, they can still be used as catalysts. Chinese traditional wood structure buildings have great plasticity, which can be recycled in the process of renewal and transformed into buildings that meet the needs of modern life. A well-preserved building can be reused, while a badly damaged one can be repurposing or molded into a public space. Through the selective recycling and reuse of traditional buildings, the physical catalyst media are shaped and interact with the original catalyst points to form a wider range and more lasting catalyst effect (Figure 17).



Fig. 17. Distribution map of old buildings in Shuiyu Village
Source: Drawing by the author

1) Function replacement of old buildings

Expansion of old function: The C-47 courtyard of the ancient private school was transformed into a physical catalyst medium, combined with the characteristics of village rock paintings, and successfully designed the "Shuiyu Cultural House" which can be compound and open in form. By replacing the functions of private schools with modern activities such as reading and creation, it attracts young people, and promotes the expansion of catalyst effect (Figure 18).



Fig. 18. Location map of C-47 courtyard and C-48 courtyard
Source: Drawing by the author

Implantation of new function: The C-47 courtyard and C-48 courtyard were jointly upgraded by catalytic media, from a single courtyard to a combination of courtyards. Retaining the courtyard pattern, introducing the artist's studio, and re-creating on the basis of Shuiyu culture to develop independent creativity, display culture and other activities. Combined with the local history and culture to strengthen the effect of catalyst media (Figure 19).



Fig. 19. Renovation of the C-47 courtyard and C-48 courtyard in Shuiyu Village

Source: Drawing by the author

Translation of old functions: The Wang Compound is ideally located for transformation into a boutique homestay [31]. After the update, modern living facilities such as kitchen, bathroom and living room are added to create a comfortable living space. Planting persimmon trees provides a pleasant environment for tourists, promotes the catalyst effect, and stimulates the vitality of Shuiyu Village (Figure 20).



Fig. 20. Wang Courtyard renovation

Source: Shuiyu Village project team

(2) Three-dimensional matching of old building space

In the transformation process of traditional buildings, after the completion of function replacement, the corresponding functions should be matched in space to meet the needs of functions and activities.

Direct replacement of space: Da Bei Yuan was originally a residential house, it still maintains its living function after being updated. Therefore, in order to meet the needs of modern life on the spatial scale, it is necessary to carry out local functional expansion and soft decoration, without large-scale changes in the spatial scale.

Internal space integration: After the renovation of Deshan Hall and Wuliu Hall into public buildings, the original living functions have been replaced by exhibition, experience and theater. In order to meet the new functional requirements, the space originally divided inside was broken up and transformed by integrating parts [32] (Figure 21).



Fig. 21. The scale of Wuliutang Small Theater renovation
Source: Shuiyu Village project team

(3) The exterior image of the old building is updated

After the transformation, the function of the traditional buildings in the village will change, so the external image, which reflects the character of the buildings, also needs to be updated [33]. Due to the early construction of traditional buildings, the facades and decorative elements may need to be reinforced and updated. The historical buildings carry rich historical information and cultural value, and its architectural design has unique village aesthetic value. In the process of renewal of the Wang courtyard, the exterior characteristics of the old house were retained, while the interior was modernized on the basis of retaining the traditional pattern to meet the comfort needs of people (Figure 22).



Fig. 22. Wang Family Courtyard preservation pattern
Source: Shuiyu Village project team

5.3.2 Spatial integration design

(1) To strengthen the dominant space

Although there are many space nodes in Shuiyu Village, the space resources are wasted because of the dilapidated state and low utilization rate. Under the guidance of the catalyst model, a clear spatial order is formed by dredging the road and dividing the level of public space, and the original catalyst points are connected to activate the vitality of Shuiyu Village (Figure 23).



Fig. 23. Distribution of public space node

Source: Drawing by the author

Improving the street space and shaping the linear catalyst media: Shuiyu Village ancient commercial road as a linear catalyst media, dominating the spatial form. Therefore, through the rectification of the business road, it can re-stimulate its role as a cultural medium [34]. The ancient trade road is conducive to connecting node space, shaping organic spatial order, and providing a positive medium for the play of catalyst effect (Figure 24).



Fig. 24. Comparison before and after the facade renovation of the commercial road in the East Village of Shuiyu Village. (a) The desolate north facade of the East business road; (b) The facade of East Village business road after renovation

Source: (a) Research and modification of protection and development model of ancient villages in Beijing based on ASIS model; (b) drawing by the author

Reshaping the village texture and shaping the surface catalyst media: It is clearly stipulated in the principles of village protection that the traditional village texture shall not be destroyed. Therefore, in the process of reshaping the place memory, the traditional village texture [35] should be continued, and different historical culture experiences should be created in combination with the life and tour routes of. By continuing the original texture and strengthening the interaction between point, line and surface media, the unique spatial image is formed.

2) To enrich intermediate areas

Make the interior space outdoor: The central part of the village needs public space, and adopts the

method of indoor space to preserve the structure of one of the buildings in the C-48 courtyard whose structure is well preserved and the form is damaged, to create external space [36], which will combine and resonate with the catalyst media of the Great North Courtyard, and trigger a wider range of catalyst effects (Figure 25).

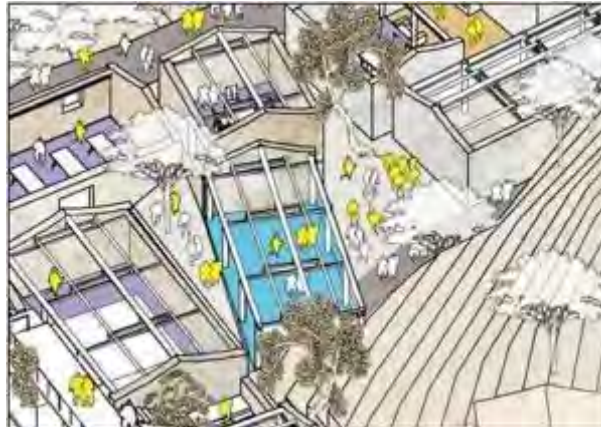


Fig. 25. Make the interior space outdoor
Source: Drawing by the author

Continuation of the spirit of the place: Shuiyu Village has a long history and culture. It embodies the cultural characteristics of Shuiyu Village through "material", introduces cultural and creative industries, and penetrates culture into life from different levels [37]. Retain the dragon-lion dance activities in the village, strengthen the construction of the Zhongvira site, reshape the spirit of the place, arouse people's cultural identity, and publicize the intangible cultural heritage (Figure 26).



Fig. 26. Shaping of place space
Source: Shuiyu Village project team

5.3.3 Landscape composite construction

The revival of traditional villages needs to improve environmental governance to attract people to return to the countryside [38]. Therefore, in the process of shaping landscape catalyst media, in addition to compound construction, it is also necessary to effectively control the damaged and polluted environment in the village and rebuild a fresh and beautiful ecological environment [39].








(1) To implant the landscape to build a rich ecological landscape

Optimization of catalyst elements of natural landscape: there are 147 protected trees in village, including ancient black trees and ancient ginkgo trees of the Ming Dynasty. Therefore, the preservation of the dependency between the ancient tree and the site arouses people's emotional resonance. (Table 9) For example, planting persimmon trees and apricot trees not only beautifies the environment, but

also provides activity places for villagers and foreign tourists (Figure 27).

Table 9

Local plant species in Shuiyu village

Varieties of trees	Arbor				Shrub		Herbal
Name	Toon tree	persimmon	sycamore tree	walnut	euonymus japonicus	Ligustrum quihoui	Turf for horse tendons
Photo							

Source: Drawing by the author

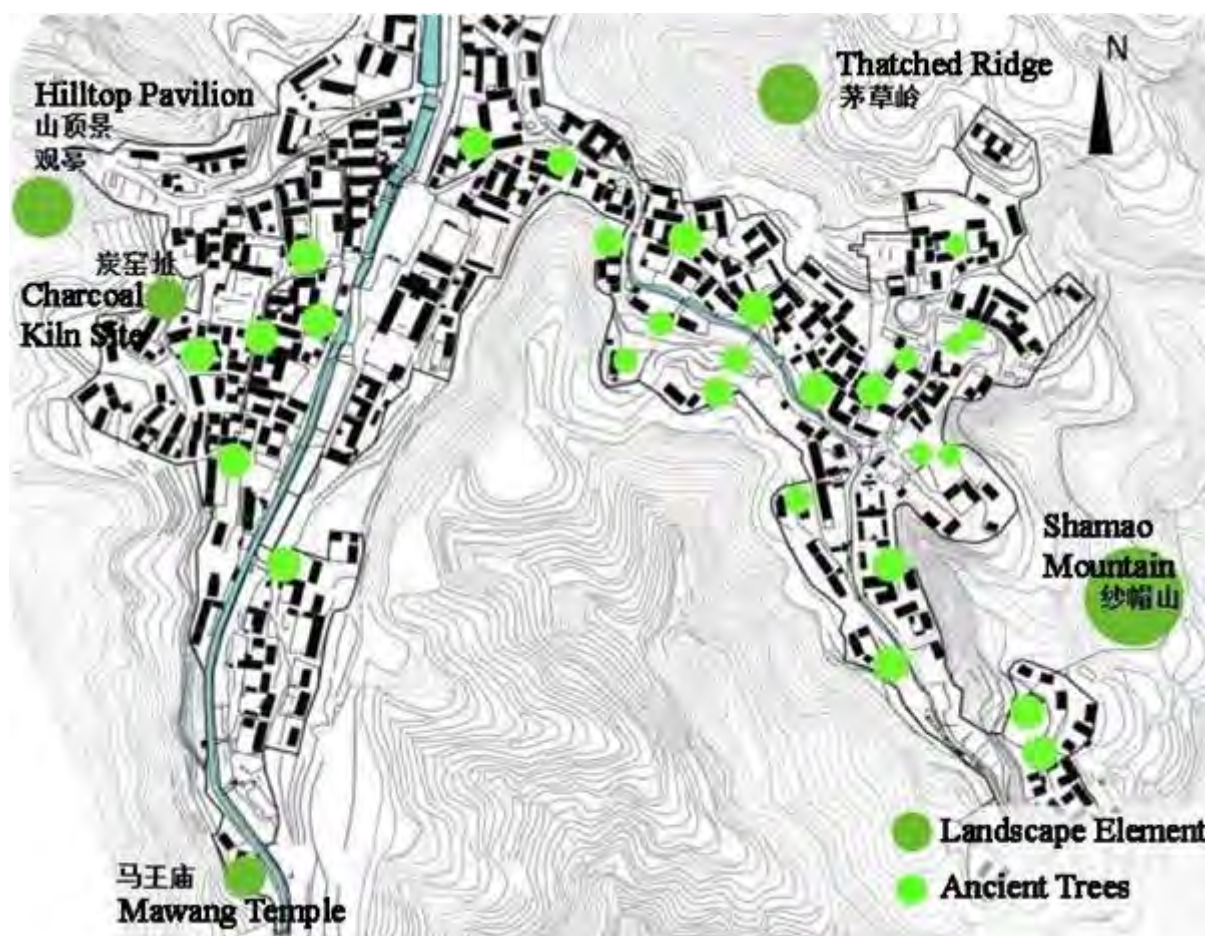


Fig. 27. Distribution map of landscape elements in Shuiyu Village

Source: Drawing by the author

Optimization of artificial landscape catalyst elements: artificial landscape elements such as ancient roller, well and stone tablet in the village carry profound historical and cultural information. Therefore, combined with the village environment in the optimization, landscape sketches and plants of different levels are implanted through artistic means of reprocessing, and public facilities such as cultural landscape sketches are shaped to create pleasant landscape space (Figure 28).



Fig. 28. Renovation of public space
Source: Shuiyu Village project team

(2) To create a unique landscape space

Local trees such as apricot, persimmon and walnut trees are planted between public spaces and buildings, along with shrubs and herbs, to form the unique landscape characteristics of village, shape landscape spaces on different bases, create three-dimensional landscape experience, and combine with other catalyst points to form a wider range of catalyst effects.

5.4 The continuation of catalyst effect in traditional villages in the suburbs of Beijing

The catalyst reaction is a gradual process reaction. Therefore, the beginning of the catalyst reaction does not mean the end of the strategy. After the catalyst point and the catalyst media are molded, the catalytic frontal elastic design, the continuous catalyst strategy and the continuously connected peripheral catalysts will expand the catalyst reaction and drive the development of the entire region[40].

5.4.1 Catalytic elastic design

The renewal of Shuiyu Village needs to continue to activate the catalyst effect to maintain the vitality of the village. Through the programmed and progressive development, the elastic space is reserved for the second renewal. According to the hierarchical division of catalyst elements, the selection of the original catalyst points was determined to prepare for the programmed progressive development (Table 10). In the renewal, the catalytic elements are graded according to their location, influence range, economic value and other factors, so as to determine the selection of original catalytic points and prepare for procedural progressive development (Figure 29).

Table 10

Shuiyu village phased update development strategy

Stage	Short term	Medium term	long term
Stage goal	To create the landmark of Shuiyu Village and enhance its recognizability and uniqueness	Implant the tertiary industry on the basis of the primary industry, drive economic development, and enhance the vitality of Shuiyu Village	Shuiyu Village integrated development, through the process of gradual development to promote Shuiyu village to continue to play the catalyst effect, healthy development, enhance the influence
Time phasing	1 year	2-3 years	3-5 years
Renewal phase I	To renew the traditional buildings with good geographical location and large influence, introduce the tertiary industry, shape the original catalyst	Introduce education base, outdoor sports, health and other functions, shape cultural and creative media, drive economic	Actively create village node Spaces such as village entrance gathering space and dragon and lion dance, improve the construction of village space system, and

	point of Shuiyu Village, and stimulate the vitality of the surrounding area	development	enhance village cohesion
Renewal phase II	The government encourages policies to mobilize the enthusiasm of villagers, enhance their sense of identity, and use intangible cultural heritage to shape cultural catalyst elements and increase attention	Implant homestay, healthy and green diet, combine the functions of primary industry and tertiary industry, create green ecological villages, and promote the economic development of villages	Shape the three-dimensional landscape, continue the ecological environment of green mountains and green water in the countryside, and create a unique village environment that coordinates the production landscape and life landscape
Renewal phase III	Promote and publicize soft catalyst elements such as media, star effect and traditional cultural activities, and launch a series of activities related to intangible cultural heritage in conjunction with festivals to enhance the visibility and exposure of Shuiyu Village and sustain the catalyst effect		Reserve flexible space for the continuous renewal of Shuiyu Village in the future, promote the overall development of the village, such as suitable for living, production and tourism, and realize the sustainable gradual and dynamic renewal and development of Shuiyu Village

Source: Drawing by the author

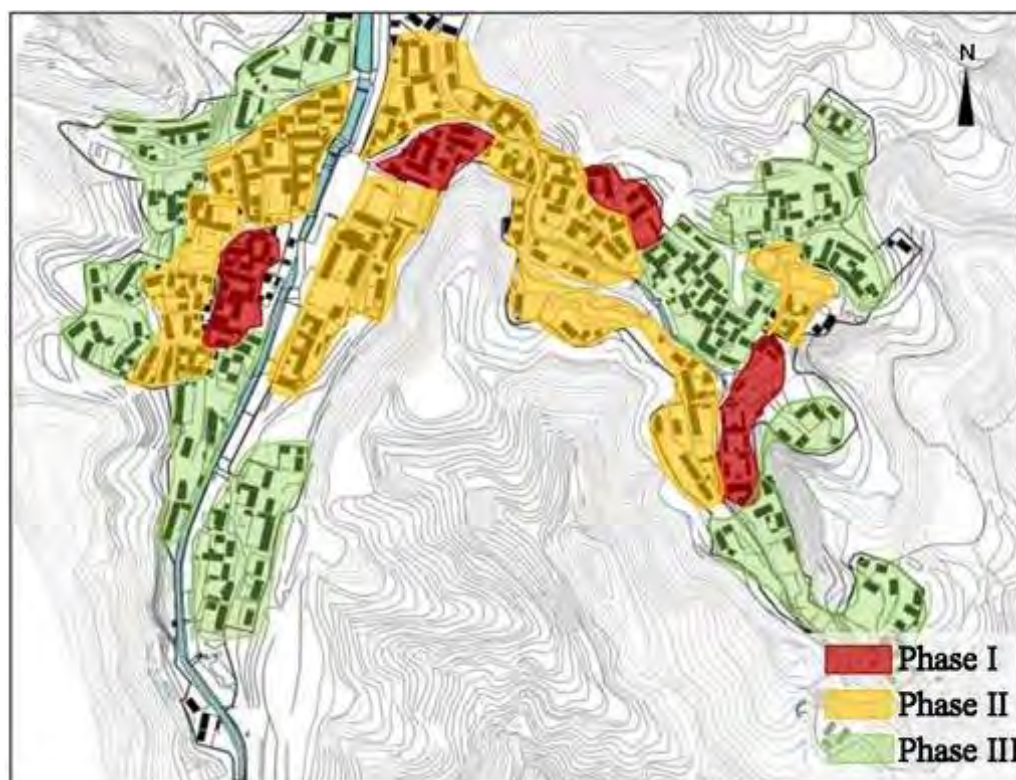


Fig. 29. Gradual renewal of Shuiyu Village

Source: Drawing by the author

5.4.2 Catalyst follow-up reaction guidance

Through the establishment of both cultural and local high-end brands and self-media publicity to

attract tourists. Encourage villagers to participate and protect their rights and interests. Encouraging social participation through soft catalysts such as land shares and villagers, and achieving positive effects.

6. Finding and discussion

By exploring the existing protection and renewal mode of traditional villages in Beijing, this paper proposes renewal and transformation strategies at the medium-micro level based on the catalyst effect, and conducts a universal study on the common problems faced by traditional villages in other regions, providing certain reference significance for traditional villages with similar problems.

At present, there are a lot of studies on the renewal and reconstruction of traditional villages, but there is no research on traditional villages from the perspective of catalyst effect, and some renewal methods are still in the initial and experimental stage. Therefore, the paper explores the renewal of traditional villages in the suburbs of Beijing from the perspective of catalyst effect to supplement the deficiencies. From individual to general, from concrete to abstract, the transformation and development of catalyst effect in the renewal of traditional villages in the suburbs of Beijing is completed.

It should be emphasized here that the practice of this paper comes from the team's case study on the renewal of Shuiyu Village in Fangshan District, and its starting point is based on the program level of village renewal. Therefore, this project has certain limitations in terms of inspection. In the future, the research will further test the construction cases of traditional villages and conduct more exploration and research on the catalytic theory in the practice of the renewal and development of traditional villages.

7. Conclusion

Traditional villages in the suburbs of Beijing are facing serious "hollowing out" and other problems, and their backwardness and depression cannot be solved only by planning and protection. Focusing on the revitalization of traditional villages in the suburbs of Beijing, this paper puts forward a renewal scheme combining protection and revitalization. By introducing Wayne Otto's urban catalyst theory, this paper systematically discusses how to apply catalyst theory to the renewal of traditional villages. According to the characteristics of catalyst theory, the feasibility of introducing traditional village renewal in the aspects of system level, overall correlation, context continuity, small number of parts and gradual process is demonstrated. By focusing on the analysis of the ideological characteristics, action types, action mechanisms and other aspects of the catalyst theory, the application strategy of introducing the catalyst theory into the traditional Beijing suburbs is obtained, that is, mining the original catalyst point, shaping the catalyst media and sustaining the catalyst effect. This renewal model aims to awaken the vitality of traditional villages, protect their history and culture, improve villagers' income, and create a livable environment.

However, there are still some challenges in this study, such as limited research data and complex problems. Future research will further explore the occurrence process of catalyst effect, as well as the coordination relationship among government, market and villagers, and strive to achieve better application of catalyst theory in the renewal of traditional villages.

Acknowledgements

This research was funded by a grant from National Natural Science Foundation of China (Serial Number: 51938002), National Natural Science Foundation of China (Serial Number: 51878021) and Beijing University of Civil Engineering and Architecture Graduate innovation project (Serial Number: PG2024003).

Thanks most sincerely to Professor Dayu Zhang for providing project practice opportunities and research funds. Thanks to Associate Professor Tao Wang for his instruction in the process of Shuiyu Village residential architecture and environment renovation project. Also, special thanks to the project team members: Zhenkun Gan, Xinze WU, Wenbo LI, Penghui GAO, Wanrong CHEN and so on.

References

- [1] Zhu, S. D. (2015). "Research on the Integrated Development Mode of Heritage Tourism of Ancient Villages Based on Symbiosis Theory—Taking Xidi Village as an Example," *Journal of Central South University of Forestry & Technology (Social Sciences)*, vol. 9, no. 04, pp. 33-37+43.
- [2] Dai, Y., Li, Y., Zhong, L. P., Ping, L. and Chen, Z. Q. (2024). "Summary and Prospect of Research on the Conservation of Historical and Cultural Villages in China," *Modern Urban Research*, no. 03, pp. 1-7.
- [3] Du, Y. and Wang, L. L. (2020). "Comprehensive Planning Strategy for Traditional Villages—Exploration of "Guide to the Protection and Utilization Planning of Traditional Villages"," *Modern Urban Research*, no. 12, pp. 2-8.
- [4] Tang, C., Yang, Y., Liu, Y. and Xiao, X. (2023). "Comprehensive evaluation of the cultural inheritance level of tourism-oriented traditional villages: The example of Beijing," *Tourism Management Perspectives*, vol. 48, p. 101166.
- [5] Attoe, W. (1992). *American urban architecture: catalysts in the design of city*, Taiwan Chuangxing Publishing House.
- [6] Chen, J. H. (2022). "Industrial Park Update and Optimization Design Strategy from the Perspective of Urban Catalysts: Taking Xiamen Longshan Wanwu Factory as An Example," *South Architecture*, no. 6, pp. 86-92.
- [7] Qin, H. D. and Hu, L. P. (2019). "Traditional Commercial District Renewal Based on Urban Catalyst Theory/," *Planning Officer*, vol. 35, no. S1, pp. 81-86.
- [8] Huang, J. N., Shan, L., Zhao, C. and Tang, N. J. (2023). "Resident-Tourist Symbiosis: Research on the Old City Renewal under the Linkage of Multi Catalyst: A Case Study of Haikou City," *Modern Urban Research*, no. 03, pp. 7-14.
- [9] Chen, Z. G., Yu, Y. and Jiang, K. R. (2022). "Research on Progress and Method of Traditional Village Preservation and Development in China from the Perspective of Catalyst Theory: Based on Knowledge Map Analysis of CiteSpace," *Urban Development Studies*, vol. 29, no. 09, pp. 22-27.
- [10] Liu, Y. Q., Guo, Q. and Xiao, L. (2021). "Studying the Protection and Refreshment of the Historic District within the Framework of the Catalyst Theory: Panxi Restaurant as a Case Study," *South Architecture*, no. 4, pp. 90-96.
- [11] Tian, J. M., Li, B. H., Liu, P. L. and Dou, Y. D. (2023). "Regeneration process of traditional village vitality based on the perspective of catalyst: a case study of Banliang ancient village," *Journal of Natural Science of Hunan Normal University*, vol. 46, no. 4, pp. 34-46.
- [12] Cui, L., Zhao, Y. and Li, D. (2020). "Design Experiment Study on the Correlation between Urban Micro-Space Renewal and Urban Catalyst Effect:Record of the International Competition for Renewal Design of Pocket Park in Nanqiao,Fengxian," *Chinese Landscape Architecture*, vol. 36, no. 8, pp. 47-51.
- [13] Sun, L. (2008). *Research on the strategy of "urban catalyst" in the revitalization of historic districts*, Master's thesis, Tongji University.
- [14] Li, X. H. (2012). *A Study on Planning Strategies of Rail Transit Station Areas of Metropolitan Fringe under Catalyst Effect*, Tianjin University.
- [15] Jan, J. (2001). *The Death and Life of Great American Cities*, Yilin Press, Beijing.
- [16] Lynch, K. (2001). *Image of the city*, Huaxia Press, Beijing.
- [17] Tao, W. and Wenjie, L. (2022). "Research on the generation of extension strategy for the transformation of residential buildings in Baoshui village, Fangshan district, Beijing," *Procedia Computer Science*, vol. 199, pp. 1377-1384.
- [18] Dai, L., Li, D. and Tang, H. (2016). "Research on the Protection and Development of Traditional Village Heritage—In the Case of Jiuyuan Village of Beijing Suburb," *Chinese & Overseas Architecture*, no. 2, pp. 68-69.
- [19] Zhang, Y., Long, H., Ma, L., Tu, S., Liao, L., Chen, K. and Xu, Z. (2019). "How does the community resilience of urban village response to the government-led redevelopment? A case study of Tangjialing village in Beijing," *Cities*, vol. 95, p. 102396.
- [20] Ye, Z. (1999). *Gushan Village—Cuanxia, Beijing*, China Architecture and Building Press, Beijing.
- [21] Liu, P. (2012). *Ancient Chinese Civilization that is Disappearing: Ancient Villages*, National Academy of Governance Press, Beijing.
- [22] Yin, J. K. (2001). *Development History of suburban villages in Beijing*, Peking University Press, Beijing.
- [23] Zhang, D. Y. (2014). *Research in Space Analysis and Practice of Beijing Ancient Villages*, Tianjin University.
- [24] Xue, L. P. (2015). *Traditional Villages in Beijing*, China Architecture and Construction Press, Beijing.
- [25] Li, Y., Ismail, M. A. and Aminuddin, A. (2024). "How has rural tourism influenced the sustainable development of traditional villages? A systematic literature review," *Heliyon*, vol. 10, no. 4, p. e25627.

- [26] Chen, X., Xie, W. and Li, H. (2020). "The spatial evolution process, characteristics and driving factors of traditional villages from the perspective of the cultural ecosystem: A case study of Chengkan Village," *Habitat International*, vol. 104, p. 102250.
- [27] Luo, D. (2015). "Village Conservation: The Activation of Architectural Minds as the Key," *New Architecture*, no. 1, pp. 23-27.
- [28] Zhang, J., Xia, J., Wang, C. and Yuan, F. (2013). "Study on the protection and development model of ancient villages in Beijing based on ASIS model—— A case study of Shuiyu Village in Fangshan District," *Beijing Planning Review*, no. 3, pp. 76-81.
- [29] Xu, Y. X. (2021). *Practical Exploration into "Catalytic" Reconstruction and Restoration of Old Towns ——Taking as an Example the Planning of Special Southern District of Yibin, the Capital of Liquor, in Sichuan Province of China*, Chongqing University.
- [30] Guan, Y. J. (2018). *Study on Renewal Strategy of Traditional Villages in Beijing Suburbs from the Perspective of Catalytic Effect——A Case Study of Shuiyu Village in Fangshan District*, Beijing University of Civil Engineering and Architecture.
- [31] Shang, Z. (2023). "Research on Catalyst Effect of Home-stay Industry from the Perspective of Rural Revitalization: Taking Xinduqiao as an Example," *Frontiers in Business, Economics and Management*, vol. 7, no. 2, pp. 239-245.
- [32] Li, B., Yang, F., Long, X., Liu, X., Cheng, B. and Dou, Y. (2024). "The organic renewal of traditional villages from the perspective of logical space restoration and physical space adaptation: A case study of Laoche village, China," *Habitat International*, vol. 144, p. 102988.
- [33] Ouyang, W. (2002). "Research in Feature of Courtyard Space in Northern Mountainsthrough the Ancient Village of Chuandixia in Beijing," *Huazhong Architecture*, no. 03, pp. 72-76.
- [34] Zhou, Z. and Zheng, X. (2022). "A Cultural Route Perspective on Rural Revitalization of Traditional Villages: A Case Study from Chishui, China," *Sustainability*, vol. 14, no. 4, p. 2468.
- [35] Norberg-Schulz, C. (2010). *The Spirit of Place——Towards Architectural Phenomenology*, Huazhong University of Science and Technology, Wuhan.
- [36] Gale, J. (2004). *Communication and space*, China Building Industry Press, Beijing.
- [37] Fei, X. (2005). *Rural China*, Beijing Press, Beijing.
- [38] Dai, Y., Wang, Z. and Huan, M. (2023). "Shifts in governance modes in village redevelopment: A case study of Beijing Lugouqiao township," *Habitat International*, vol. 135, p. 102795.
- [39] Peng, Y. (1992). *Landscape analysis of traditional villages and towns*, China Building and Architecture Press, Beijing.
- [40] Lu, T. (2016). *Discussion on the revival of functional space in historical areas from the perspective of vitality construction*, Master's thesis, Southeast University.