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Exploration of Strategies and Principles for Adaptive Regeneration of Shrinking Traditional Villages

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Abstract: *Against the backdrop of the in-depth advancement of the Rural Revitalization Strategy and the New-type Urbanization Strategy, a large number of traditional villages in China have fallen into the predicament of shrinkage. Problems such as population loss, functional decline and resource scarcity have restricted their sustainable development. Based on the theory of adaptive regeneration, this paper focuses on the core demands of the renewal and reconstruction of shrinking traditional villages, and systematically puts forward the strategies and principles of adaptive regeneration from four dimensions: the construction of adaptive evaluation system, environmental and ecological adaptation and functional activation, sustainable growth mechanism, and guarantee mechanism. By means of low-cost and targeted intervention measures, this paper realizes the dynamic balance between the existing problems and development of villages, provides theoretical and practical references for shrinking traditional villages to improve the quality of human settlements and delay decline, and contributes to the sustainable development and cultural inheritance of villages.*

Keywords: *Shrinking traditional villages; Adaptive regeneration; Renewal strategies; Sustainable development; Public participation*

1. Introduction

With the acceleration of urbanization, traditional villages in China are confronted with the normalized challenge of "shrinkage", where problems such as spatial contraction, population aging, industrial monotony, and cultural inheritance discontinuity have become increasingly prominent [1]. Most of the renewal and reconstruction projects of traditional villages rely on large-scale capital investment and comprehensive reconstruction, which are difficult to adapt to the realistic predicament of insufficient funds and limited resources in shrinking villages. The theory of adaptive regeneration emphasizes "survival with problems" as the core, and realizes the symbiosis between villages and existing problems through dialectical intervention. It breaks the traditional one-size-fits-all renewal model and provides a low-cost and implementable renewal path for shrinking traditional villages.

Based on the realistic predicament of shrinking traditional villages and from a multidisciplinary perspective, this paper constructs a system of strategies and principles for adaptive regeneration. It aims to realize the efficient utilization of village resources, the organic activation of functions and the sustainable inheritance of culture through scientific evaluation, ecological adaptation, morphological optimization and multi-stakeholder co-governance, thereby providing systematic solutions for the renewal and reconstruction of similar villages.

2. Construction of an Adaptive Evaluation System

The prerequisite for adaptive regeneration is the scientific cognition of the current situation of villages, and the construction of a comprehensive and accurate evaluation system lays the foundation for the implementation of subsequent strategies. The evaluation system should balance scientificity and practicality, comprehensively cover the core dimensions of village renewal, and be operable at the same time [2].

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2.1 Principles for Selecting the Evaluation System

(1) Scientificity and Practicality: Based on multidisciplinary theories such as urban planning, architecture and landscape architecture, the design of indicators should truly reflect the current situation of village renewal. The data should be easily accessible and the calculation should be operable, so as to provide direct basis for policy formulation and practical operation.

(2) Comprehensiveness and Representativeness: Covering four core dimensions, namely urban planning and design, architectural design, landscape design and interior design, the system selects key indicators that can represent the overall situation of villages, balances systematicness and conciseness, and avoids redundancy.

(3) Systematicness and Operability: The indicators form logical connections to constitute a complete evaluation framework, while balancing theoretical value and practical feasibility, so as to ensure that the evaluation results can directly guide the renewal and reconstruction actions.

2.2 Methods for Selecting the Evaluation System

The adaptive regeneration evaluation system consists of 4 primary indicators, 20 secondary indicators and 56 specific evaluation indicators. The primary indicators include urban planning and design (site selection, transportation, spatial layout, etc.), architectural design (function, circulation, spatial scale, etc.), landscape design (natural landscape, artificial landscape, supporting facilities, etc.) and interior design (spatial function, interface treatment, physical environment, etc.) (Table1). Through weight determination, matrix construction and indicator assignment, the system scientifically evaluates the value and problems of village renewal and reconstruction, providing quantitative support for the formulation of subsequent strategies [3].

Table 1 Evaluation index system and code of traditional village design

(Source: Self-compiled)

Target Layer	Criterion 1 Layer	Criterion 2 Layer	Indicator Layer
Evaluation of Traditional Village Renewal and Reconstruction Design (A)	Urban Planning and Design (B)	Site Selection (C1)	Quality of Living Landscape (D1)
			Completeness of Supporting Facilities (D2)
			Transportation Convenience (D3)
			Environmental Noise (D4)
		Transportation (C2)	Pedestrian System (D5)
			Separation of Pedestrians and Vehicles (D6)
		Spatial Layout (C3)	Layout Form (D7)
			Spatial Recognition (D8)
			Sense of Safety and Belonging (D9)
		Building Arrangement (C4)	Layout of Functional Buildings (D10)
			Building Orientation (D11)
			Building Spacing (D12)
			Building Height or Number of Floors (D13)
	Urban Planning and Design (B1)	Site Layout (C5)	Activity Spaces (D14)
			Labor Spaces (D15)
			Parking Lots (D16)
		Long-term Sustainability (C6)	Sustainable Development (D17)
	Architectural Design (B2)	Function (C7)	Functional Layout (D18)
			Functional Spaces (D19)
			Lighting and Ventilation (D20)
		Circulation (C8)	Circulation Organization (D21)
			Barrier-free Design (D22)
		Space (C9)	Spatial Scale (D23)
			Spatial Combination (D24)
		Indicators (C10)	Green Space Rate (D25)
		Style and Form (C11)	Building Materials and Colors (D26)
			Building Volume and Form (D27)
			Characteristics of Architectural Style (D28)
		Site Design (C12)	Road Design (D29)
			Greening Design (D30)
	Landscape Design (B3)	Natural Landscape (C13)	Vegetation (D31)
			Water Bodies (D32)
		Artificial Landscape (C14)	Small-Scale Landscape Features (D33)
			Pavement (D34)
			Lighting (D35)
		Supporting Facilities (C15)	Signage System (D36)
			Public Toilets (D37)
			Water Supply and Drainage Facilities (D38)
			Fitness and Entertainment Facilities (D39)
			Safety and Sanitation Facilities (D40)
	Interior Design (B4)	Space (C16)	Spatial Function (D41)
			Spatial Atmosphere (D42)
			Spatial Signage (D43)
		Interface Treatment (C17)	Floor Treatment (D44)
			Wall Treatment (D45)
			Doors, Windows, and Railings (D46)
		Furnishings and Decoration (C18)	Furniture (D47)
			Household Appliances and Equipment (D48)
			Green Plants and Decorations (D49)
		Physical Environment (C19)	Water and Electricity Design (D50)
			Lighting (D51)
			Ventilation and Heat Insulation (D52)

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			Sound Insulation and Noise Reduction (D53)
		Information and Rescue Facilities (C20)	Intelligent Communication (D54)
			Alarm Facilities (D55)
			Emergency Rescue Equipment (D56)

For example, the urban planning and design dimension includes indicators such as the quality of living landscape, completeness of supporting facilities, and transportation convenience; the architectural design dimension focuses on functional layout, spatial combination, and characteristics of architectural style; the landscape design dimension pays attention to elements such as vegetation, small-scale landscape features, and lighting; the interior design dimension involves details such as spatial function, physical environment, and intelligent communication. Through the multi-dimensional and multi-level indicator system, the current situation of villages is comprehensively diagnosed, laying a foundation for targeted interventions [4].

3. Environmental and Ecological Adaptation and Functional Activation

Environmental and ecological adaptation and functional activation are the core of adaptive regeneration. On the basis of retaining the authenticity of villages, it is necessary to activate the endogenous driving force of villages through industrial form implantation, landscape construction, and facility optimization.

3.1 Emphasis on Authenticity and Dynamic Inheritance

Preservation of core village features: Based on the original pattern and texture of villages, large-scale demolition and style reconstruction should be avoided, and core elements such as traditional buildings and street patterns should be prioritized for preservation. For non-essential renovation projects, if the cost is too high, partial optimization can be chosen, allowing villagers to carry out spontaneous improvements without damaging the overall style. For example, in the renovation of Longtang Village in Guizhou, with an investment equivalent to the cost of villagers' self-construction, the core form of stilted buildings was retained, and only the residential functions were optimized, which not only maintained authenticity but also improved living comfort.

Dynamic inheritance of culture: Intangible cultural heritage such as folk culture and traditional crafts should be dynamically inherited through new media promotion, integration into campus culture, and artistic innovation [5]. Tap idle village resources to create carriers such as research bases and handicraft workshops, achieving a win-win situation for cultural inheritance and villagers' income increase. For instance, Juxi Village used idle residential buildings to build Confucianism halls and pottery workshops, and held cultural gatherings and parent-child research activities, enabling Confucian culture to be inherited in daily activities.

3.2 Implantation of Industrial Forms in Hollowed Villages

According to the resource endowments and development foundations of villages, they are divided into five types: priority revitalization type, preparatory revitalization type, preservation and maintenance type, declining relocation type, and priority relocation type, with targeted implantation of suitable industrial forms. For shrinking villages, the focus is on developing low-cost industrial forms such as characteristic planting, rural tourism, and idle space leasing to activate the vitality of hollowed villages [6]. (Table 2)

Table 2 Development Measures for Different Types of Villages

(Source: Self-compiled)

Village Type	Characteristics	Development Measures
Priority Revitalization Type	Favorable geographical location, natural background, resource endowments, sound economic foundation, and population agglomeration	Scenic area development and construction of tourism-specialized villages
Preparatory Revitalization Type	Certain location advantages, sound economic foundation, abundant natural resources, and large population	Introduction of external capital, talents, and technology; development of new industries and formats such as green ecological agriculture and folk tourism based on market demand
Preservation and Maintenance Type	Poor resource conditions, weak economy, limited development potential, small population scale, and severe population loss	Improvement of human settlements, enhancement of production and living conditions, development of characteristic industries, and integrated development with neighboring villages
Declining Relocation Type	Few advantages, low development level, limited potential, and vulnerability to decline	No large-scale infrastructure investment; timely relocation to other places; improvement of production and living environments
Priority Relocation Type	No advantages, harsh living conditions, fragile ecological environment, and backward infrastructure and public facilities	Ecological poverty alleviation relocation, ecologically livable relocation, village agglomeration relocation; improvement of production and living environments; strengthening of ecological conservation functions

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For example, Jiangxiang Village in Changshu built an ecological tourist park relying on its ecological advantages, realizing the integrated development of primary, secondary, and tertiary industries; Xunpu Village used discarded shell resources to create the "oyster shell house" architectural landscape and develop characteristic tourism, achieving the dual goals of waste resource utilization and cultural inheritance ; some shrinking villages transformed idle farmhouses into rural pension communities and art studios, or developed ecological sightseeing agriculture relying on natural landscapes, realizing industrial diversification.

3.3 Characteristic Presentation of Humanities and Landscapes

Designers adopt the concept of low-cost landscape design, maximize the use of local resources and waste materials, and create humanistic landscapes with regional characteristics. They construct ecologically beautiful and easy-to-maintain landscape facilities through waste utilization, local material application, and simple technological transformation, avoiding excessive commercialization and homogenization.

For example, use waste agricultural tools to make landscape features, and lay pedestrian paths with pebbles and old stone slabs, which not only reduces costs but also highlights local characteristics; some villages transform waste tires and plastic bottles into flower pots and lighting fixtures through DIY methods, creating low-cost and highly recognizable village landscapes; integrate regional cultural symbols into landscape construction, such as transforming traditional patterns and folk elements into pavement patterns and small-scale landscape shapes, strengthening the cultural identity of villages .

3.4 Configuration of Public Service Facilities Based on Living Circles

We should construct a public service facility allocation system for the living circle at the "village-community-town" levels based on the classification of travel distances, usage frequencies and types of public service facilities among different resident groups [7]. The village living circle focuses on infrastructure such as village clinics, convenience stores, and outdoor fitness spots; the community living circle supplements primary schools and cultural activity centers; the town living circle improves middle schools and health service centers.

Four key points should be emphasized in the configuration process: first, balance supply and demand to avoid facility idleness and resource waste; second, realize functional diversification to meet villagers' diverse needs such as medical care, culture and sports, and elderly care; third, pursue refined quality to improve service quality and user experience; fourth, promote public participation, fully solicit villagers' opinions, and ensure that facilities meet actual needs. For example, the village living circle is equipped with village clinics and outdoor fitness spots, the community living circle adds cultural activity centers and primary schools, and the town living circle improves middle schools and health service centers, forming a public service network covering the entire life cycle. (Table 3)

Table 3 Village Public Service Facilities in the Living Circle Model

(Source: Self-compiled)

		Village Living Circle	Community Living Circle	Town Living Circle
Spatial Boundary		Maximum radius: 1.5 km Optimal radius: 0.5 km	Maximum radius: 2.5 km Optimal radius: 1.5 km	Maximum radius: 4 km Optimal radius: 2.5 km
Definition Basis		15-30 minutes' walk for young children and the elderly	30-45 minutes' walk for primary school students	45-60 minutes' walk or 30 minutes' bicycle ride for middle school students
Public Service Facilities		Village Committee	Community Affairs Service Center	Town Government
	Basic Guarantee Type	Village Clinic Outdoor Fitness Spot Multi-functional Activity Room Convenience Store —— —— —— —— —— ——	Primary School Kindergarten Cultural Activity Center Health Service Center Outdoor Fitness Field Vegetable Market —— —— —— Welfare Facilities	Health Service Center Cultural Activity Center Community Sports Center High School Junior High School Primary School Kindergarten Community School Vegetable Market Welfare Facilities
	Quality Improvement Type	Indoor Fitness Spot Comprehensive Service Room Day Care Center	Junior High School Community School ——	—— —— ——

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Community Affairs Agency Center	____	____
Comprehensive Agricultural Service Station	____	____

4. Sustainable Adaptive Growth Mechanism

A sustainable growth mechanism is the guarantee for the long-term healthy development of villages. It is necessary to construct a flexible and self-adaptive spatial development model through the improvement of spatial boundaries and the optimization of internal forms.

4.1 Improvement of Village Spatial Boundaries

For the maintenance of interface continuity, we protect the integrity of villages' natural and artificial boundaries, strengthen the connection between villages and their surrounding environments through vegetation restoration, architectural style coordination and other measures, and resist the erosion of urbanization on villages. For example, Xidi Village in southern Anhui maintained the organic integration of the village and the natural environment by protecting natural boundaries such as mountains and streams; some villages maintained the continuity of the overall village style by unifying architectural styles and restoring artificial boundaries such as walls [9].

Creation of spatial clarity: Set transition spaces at village boundaries, retain natural elements such as ancient trees and streams, clarify the boundary between villages and the external environment, and improve spatial recognition and visual experience. Reasonably set transition areas according to building heights to ensure the best viewing and use effects. For example, set iconic elements such as landscape stones and archways at village entrances, and retain natural landscapes such as farmland and woodlands in boundary areas, forming an orderly connection of "village - transition space - external environment".

4.2 Adaptation of Village Internal Forms

Formulate differentiated strategies for villages with different forms such as linear, circular, and clustered forms:

For linear villages, we sort out transportation functions and separate internal and external traffic; we save land use and guide the inward relocation of distant construction areas; we preserve unique historical and cultural elements to avoid unrestricted urban sprawl.

For circular villages, we optimize the utilization of public facilities and strengthen traffic evacuation in the central area; we rationally control the development direction of villages to avoid excessive congestion in the core area.

For clustered villages, we rationalize inter-cluster transportation and clarify the functional division of labor; we demarcate each cluster by green belts and green corridors to realize the coordinated development of all clusters.

By improving the spatial shortcomings of villages and optimizing the internal structure, a sustainable spatial pattern of "clear boundaries, internal coordination, and flexible growth" is constructed to adapt to the dynamic changes of village population and functions [8].

5. Adaptive Guarantee Mechanism

Public participation is a key guarantee for adaptive regeneration. It is necessary to construct a multi-subject co-governance mechanism to ensure that renewal and reconstruction meet villagers' needs and achieve long-term sustainable development [9].

5.1 Subjects and Contents of Public Participation

Participating subjects: Include township governments, village committees (two committees), villagers, and planners. Township governments are responsible for policy guidance and resource coordination; village committees take the lead in project implementation and talent training; villagers, as core participants, participate in village planning, construction, and management; planners provide

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professional technical support.

Participation contents: Cover key links such as the formulation of village development plans, the construction of public facilities, environmental governance, and industrial development. Township governments focus on policy formulation and fund coordination; village committees are responsible for project implementation and villager organization; villagers participate in the solicitation of planning opinions, construction supervision, and facility maintenance; planners provide technical guidance and plan optimization.

5.2 Roles and Suggestions of Public Participation

The role of this strategy is reflected in its ability to integrate governance resources through the co-governance of multiple subjects, realize a village management model featuring "putting public opinions first, taking autonomy as the core and administration as the supplement", and improve the scientificity and feasibility of village renewal. Meanwhile, it can arouse villagers' sense of responsibility, promote the conscious maintenance of public facilities, and foster endogenous driving forces for village development.

This strategy puts forward the following suggestions: First, adhere to the principle of "Party leadership and community-led implementation, mass autonomy", and improve the village regulations and agreements as well as the supervision, evaluation and assessment mechanism; second, stimulate villagers' enthusiasm for participation through interest incentives, reputation recognition and other means, such as establishing honorary titles including "Model Household for Environmental Governance" and "Model of Cultural Inheritance"; third, set up a multi-stakeholder collaborative supervision mechanism, feed back the effect of governance implementation in a timely manner to ensure the effective implementation of the planning, such as holding villagers' representative assemblies on a regular basis and publicizing the progress of projects and the details of fund utilization[10].

6. Conclusion

The adaptive regeneration of shrinking traditional villages is a systematic project. It needs to be based on scientific evaluation, and realize low-cost and targeted renewal and reconstruction through four strategies: environmental and ecological adaptation, functional activation, sustainable growth, and public participation guarantee. The core lies in abandoning the traditional one-size-fits-all reconstruction thinking, realizing the symbiosis between villages and problems through dialectical intervention, and activating their endogenous development momentum while retaining the authenticity and cultural characteristics of villages.

The strategies and principles of adaptive regeneration proposed in this paper emphasize taking villagers' needs as the core, focusing on low cost and implementability, and helping shrinking traditional villages improve the quality of human settlements, delay decline, and inherit culture through multi-dimensional and multi-level intervention measures. In the future, it is necessary to further combine the practice of specific villages, continuously optimize adaptive regeneration strategies, improve the evaluation system and guarantee mechanism, and provide replicable and promotable solutions for the revitalization of more shrinking traditional villages.

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