

Research on Paths of Differentiated Whole-Territory Comprehensive Land Consolidation in Rural Areas

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Abstract

Against the backdrop of rapid urbanization, China's urban-rural dual structure has persisted over the long term, with problems such as insufficient rural development, inefficient land use, and ecological degradation constraining high-quality development. As a key policy tool for reshaping territorial spatial patterns and empowering rural revitalization, comprehensive land consolidation is currently facing practical dilemmas including unitary objectives and homogenized models. Based on the fundamental nature that villages are complex dynamic systems, this study adopts the theoretical framework of mutual feedback among "factors-structures-functions". Combined with the latest classification ideas set forth in the Comprehensive Rural Revitalization Plan (2024–2027), rural areas are classified into six dominant functional types, namely agglomeration upgrading, urban-suburban integration, characteristic conservation, relocation and consolidation, activation and optimization, and ecological protection. This paper systematically elaborates the differentiated coupling logic of whole-territory comprehensive land consolidation corresponding to each rural type. Furthermore, this study puts forward an analytical path of "consolidation demand identification – consolidation potential measurement–spatial overlay matching". On the basis of the current status of rural production-living-ecological spaces, consolidation demands are accurately diagnosed. A potential evaluation framework is established by integrating multi-dimensional constraining factors including population, economy, society and culture. Subsequently, seven differentiated practical paths are generated through the spatial overlay of consolidation demands and potentials, specifically: "land consolidation + smart agriculture empowerment", "land consolidation + digital-intelligent industrial upgrading", "land consolidation + urban-rural integration and co-promotion", "land consolidation + agritourism experience enhancement", "land consolidation + orderly relocation and resettlement", "land consolidation + facility optimization for ecological supply", and "land consolidation + ecological supply quality improvement". The study reveals that the heterogeneity of rural typologies dictates that whole-territory comprehensive land consolidation must adhere to the inherent logical chain of "target positioning – problem diagnosis – path adaptation", rather than adopting a one-size-fits-all uniform model. The classified targeted governance framework constructed in this paper can deliver operable spatial governance guidelines for villages with disparate consolidation potentials and development demands. Meanwhile, it provides a theoretical foundation for refining differentiated institutional safeguards and dynamic regulation mechanisms supporting whole-territory comprehensive land consolidation.

Keywords

Whole-Territory Comprehensive Land Consolidation; Rural Revitalization; Rural Typology; Consolidation Potential; Differentiated Governance.

1. Introduction

China is currently in a stage of rapid urbanization, with the urbanization rate reaching 67.89% in 2025 and projected to reach 71% by 2030. This rapid urbanization drives the transformation and restructuring of urban-rural relations. The 20th National Congress of the Communist Party of China first proposed the construction of "livable, suitable-for-industry and beautiful countryside," aiming to coordinate rural systems. The Fourth Plenary Session of the 20th Central Committee of the CPC(2025) reiterated the need to "accelerate agricultural and rural modernization and solidly promote comprehensive rural revitalization" [1], whose core tasks include promoting integrated urban-rural development and coordinated regional development. Alongside the introduction of the rural revitalization strategy, urban-rural integration has become an inevitable choice following the strategies of urban-rural coordination and integrated development, to further break the urban-rural dual structure and promote the unification of urban-rural functions and the realization of diversified rural values [2]. Nevertheless, rapid urbanization has accelerated the cross-flow of urban and rural factors, yet perpetuated the long-standing urban-rural dual structure. A series of prominent bottlenecks including unbalanced urban-rural development, inadequate rural development, abandoned cultivated land, idle rural homesteads and deteriorating ecological environment remain critical constraints restricting high-quality development in China[3].

Land serves as the spatial carrier for human socioeconomic activities and constitutes the essential factor guarantee and key link for achieving integrated urban-rural development [2-4]. Against the backdrop of socioeconomic transformation between urban and rural areas, rural land consolidation acts as an effective approach to optimize the allocation of land resources, advance integrated urban-rural planning, and support agriculture, rural areas and farmers, and it constitutes a vital starting point for implementing the rural revitalization strategy[3]. Comprehensively promoting the integrated consolidation of "mountains, water, forests, fields, roads, villages, and towns" and timely adjusting land use patterns is conducive to forming new spaces for high-quality development [4], helping to establish a coordinated urban-rural pattern, advancing the urban-rural integration process, and achieving the unity of efficiency and equity in urban-rural land resource allocation [5]. Nevertheless, current whole-territory comprehensive land consolidation is plagued by prominent drawbacks including oversimplified consolidation objectives, homogenized consolidation models, one-size-fits-all consolidation paths and ineffective spatial remediation, which severely constrain consolidation performance.

Taking urban-rural spatial heterogeneity into account, promoting rural development by category and carrying out differentiated whole-territory comprehensive land consolidation [5-6] lay the foundation for facilitating the transformation of land consolidation to meet the development demands of the new era, alleviating the acute human-land contradiction at the current stage, shaping a coordinated urban-rural development pattern, accelerating the urban-rural integration process, and unifying efficiency and equity in the allocation of urban and rural land resources [2,5]. As the basic implementation unit of whole-territory comprehensive land consolidation [7], townships conduct overall planning of agricultural land, construction land and unused land at the regional scale. Such land management approaches have a long development history and yielded certain practical achievements overseas. Foreign scholars have focused on addressing the issue of unregulated urban sprawl[8]. Starting from the urbanization process and its attendant challenges, they have thoroughly discussed the vital role

of rural land governance in advancing sustainable development[2,8]. Based on Central Place Theory, existing studies have explored the classification and grading of rural settlements, with research emphases laid on rural location conditions, hierarchical division of rural systems, and assessment of rural development potential[2,9]. Research on rural whole-territory comprehensive land consolidation has surged among domestic scholars. In terms of research content, most domestic scholars discuss rural land consolidation against the backdrop of the new era by targeting the relationships and conflicts between urban and rural land use, with research focusing on macro-level exploration of land planning strategies and spatial layouts. Zang Yuzhu[10] explored the models of whole-territory comprehensive land consolidation from the perspective of rural poverty alleviation and development at the national scale. Jiang Wei[11] argued that rural spatial consolidation in Sichuan Province in the new era should adopt a comprehensive design perspective, and positioned whole-territory land consolidation as the rural manifestation of urban design. In terms of research methodologies, existing studies explore rural whole-territory comprehensive land consolidation by integrating multiple analytical approaches including hierarchical clustering, multi-level fuzzy optimization models, and GIS spatial overlay analysis[2,12-15], based on perspectives such as rural resilience theory, land market development, rural homestead system reform, and farmers' willingness to participate. Sun Jingwen[13] proposed adopting multi-methods to analyze the interactive effects of influencing factors of whole-territory comprehensive land consolidation, and conducted evaluations on consolidation potential of various rural land types, farmers' willingness to carry out consolidation, and consolidation performance. Bao Haijun et al.[15-17] pointed out that China's land consolidation requires an overall framework design based on public participation. Wang Jun[16] put forward approaches and methods for landscape ecological construction of land consolidation at multi-scales to guide the ecological landscape practice in land consolidation projects. Numerous scholars have proposed regional technical approaches for land consolidation projects by identifying major limiting factors for project implementation, considering the unique natural environmental conditions of specific regions. Overall, existing studies have attempted to construct analytical frameworks to interpret the models and disparities of whole-territory comprehensive land consolidation from diverse perspectives and via various methodologies. Nevertheless, few studies have focused on differentiated whole-territory comprehensive land consolidation targeting micro-scale villages with disparate development conditions.

During the rapid progress of urbanization, internal disparities among rural settlements are widening day by day in terms of geographic location, population size, land use structure, industrial development and other dimensions. Driven by the demand for rural restructuring in China, divergent driving forces within rural internal core systems lead to heterogeneity in their future development orientations as well as intervention and regulation by relevant stakeholders[18]. Such heterogeneity further results in distinct development potentials and paths across villages. Therefore, the core research challenge to be addressed lies in exploring how to implement differentiated whole-territory comprehensive land consolidation by identifying rural typologies based on rural heterogeneity and matching their consolidation potentials. In view of the above context, grounded in the rural revitalization strategy and guided by the principle of supporting rural development, this research clarifies the complexity and diversity of rural typologies. It further dissects the internal logical relationship between rural typologies and whole-territory comprehensive land consolidation under the analytical framework of "potential orientation – goal setting – implementation path", and investigates differentiated practical paths for whole-territory comprehensive land consolidation. This study aims to provide theoretical and practical references for carrying out whole-territory comprehensive land consolidation in diverse rural types with varying consolidation potentials.

2. Formation of the Whole-Territory Comprehensive Land Consolidation System in the New Era

2.1. Historical Evolution of the Whole-Territory Comprehensive Land Consolidation System

The revised Land Administration Law of the People's Republic of China in 1998 first stipulated that "the State encourages land consolidation", which established the legal status of land consolidation in China. Since then, central and local land consolidation authorities have been successively set up. At this stage, the work mainly focused on expanding cultivated land quantity and improving cultivated land quality, known as the stage of land development and consolidation. Common engineering measures included land leveling and improvement of basic supporting facilities to facilitate land transfer and large-scale agricultural operation. The Third Plenary Session of the 17th Central Committee of the CPC in 2008 proposed to "carry out large-scale land consolidation". Land consolidation was expanded from single cultivated land protection to integrated management covering quantity, quality and ecology, shifting its core objective from merely tapping new cultivated land sources to the coordinated improvement of land quantity and quality[3]. While consolidating construction land, greater attention was paid to ecological restoration and rural renovation. The Strategic Plan for Rural Revitalization released in 2018 put forward top-level design requirements for whole-territory consolidation. In 2019, the Ministry of Natural Resources issued the Circular on Carrying out Pilot Work of Whole-Territory Comprehensive Land Consolidation, marking that land consolidation had evolved into an all-territory, all-factor spatial governance and value regeneration practice. To implement the rural revitalization strategy and advance the construction of livable, suitable-for-industry and beautiful countryside, current whole-territory comprehensive land consolidation has undergone comprehensive transformations in its philosophy, connotation, planning logic and development objectives, rendering it a vital instrument for ecological civilization construction, coordinated urban-rural development and rural revitalization realization.

2.2. Connotation and Content of Whole-Territory Comprehensive Land Consolidation

The governance connotation of whole-territory comprehensive land consolidation (WTCLC) has been continuously enriched since 1998. It is far more than simple land development or land arrangement, and embodies a systematic transformation of governance philosophy and practical approaches. In terms of conceptual understanding, the scope has expanded from individual land parcels to all factors, all land types and full territorial spaces. Cross-township coordinated consolidation is carried out to achieve overall regional optimization. The implementation scope covers the entire production, living and ecological spaces within the jurisdiction, facilitating spatial reconstruction and resource reorganization. In essence, WTCLC has shifted from fragmented, single-point project governance to systematic and comprehensive spatial optimization. Its planning logic has evolved from static blueprint planning to dynamic implementation. Through the interaction between local policy formulation and pilot exploration, planning optimization and project iteration can be realized. In terms of functional positioning, WTCLC has transformed from merely supplying land resources and construction quotas to a comprehensive platform that aligns with top-level national strategies and integrates grassroots resources, thereby forming joint governance forces on a full-territory platform. Its core goals have shifted from expanding cultivated land and boosting production efficiency to regenerating spatial value. WTCLC balances the demands of governments, villagers and market entities, and further pursues industrial prosperity, ecological livability, rural cultural vitality

and effective governance, so as to ultimately realize the shared prosperity of urban and rural areas.

At present, the objects of whole-territory comprehensive land consolidation cover all dimensions of production, living and ecological spaces, including agricultural land, construction land and unused land. Synthesizing abundant academic studies, the standardized consolidation contents can be categorized into four major types: quality improvement of agricultural land, optimization of construction land, rural ecological restoration, and protection of rural historical and cultural heritage (Table 1).

Table 1. Contents of Whole-Territory Comprehensive Land Consolidation

Consolidation Type	Project Contents
Quality Improvement of Agricultural Land	Farmland quality upgrading and transformatio
	High-standard farmland construction
	Reclamation of wasteland
	Upgrade of water conservancy facilities
	Three-in-one protection of cultivated land
	Dryland-to-paddy field transformation
Optimization of Construction Land	Urban-rural construction land increase-decrease linkage
	Consolidation of inefficient industrial land and urban low-efficiency land
	Construction of public service and infrastructure facilities
	Consolidation of rural homesteads
Rural Ecological Restoration	Protection and restoration of mountain-river-forest-farmland-lake-grass ecosystems
	Watershed ecological governance
	Mine ecological restoration
	Geological disaster prevention and control
Rural Historical and Cultural Heritage Protection	Renovation and protection of rural landscape style
	Protection of historical cultural veins
	Renovation of rural human settlements
	Inheritance and protection of rural folk customs

3. Coupling Logic between Rural Multi-types and Whole-Territory Comprehensive Land Consolidation

3.1. Identification of Rural Types

A village is a territorial complex endowed with natural, economic and social attributes, where rural residents conduct living and productive activities within the territorial space[1-2]. Human resources, land resources and industrial development constitute the core elements of rural development[18]. At present, these core elements vary widely across villages due to the impacts of urban-rural development, policies and institutions, and innovations in production technologies. Within the mutual feedback system of “factors-structures-functions” (Figure 1), rural demographic structure, industrial structure, land use structure and ecological structure undergo transformations, which further reshape rural multifunctions including production function, human settlement function, cultural inheritance function and ecological barrier function[5]. With the rapid advancement of industrialization and urbanization, rural development has become diversified. Continuous integration of rural elements helps villages break away from overreliance on traditional agricultural production functions and evolve into

multifunctional rural spaces. By integrating natural environmental protection, exploitable resource development and cultural heritage tourism, rural areas are shifting from single human settlement and production functions to diversified composite functions. Nevertheless, each village retains its dominant function in the development process. Based on the dominant functions of rural development and in line with the latest classification framework specified in the Comprehensive Rural Revitalization Plan (2024–2027), this paper categorizes villages into six types: agglomeration upgrading type, urban-suburban integration type, characteristic conservation type, relocation and consolidation type, activation and optimization type, and ecological protection type (Table 2).

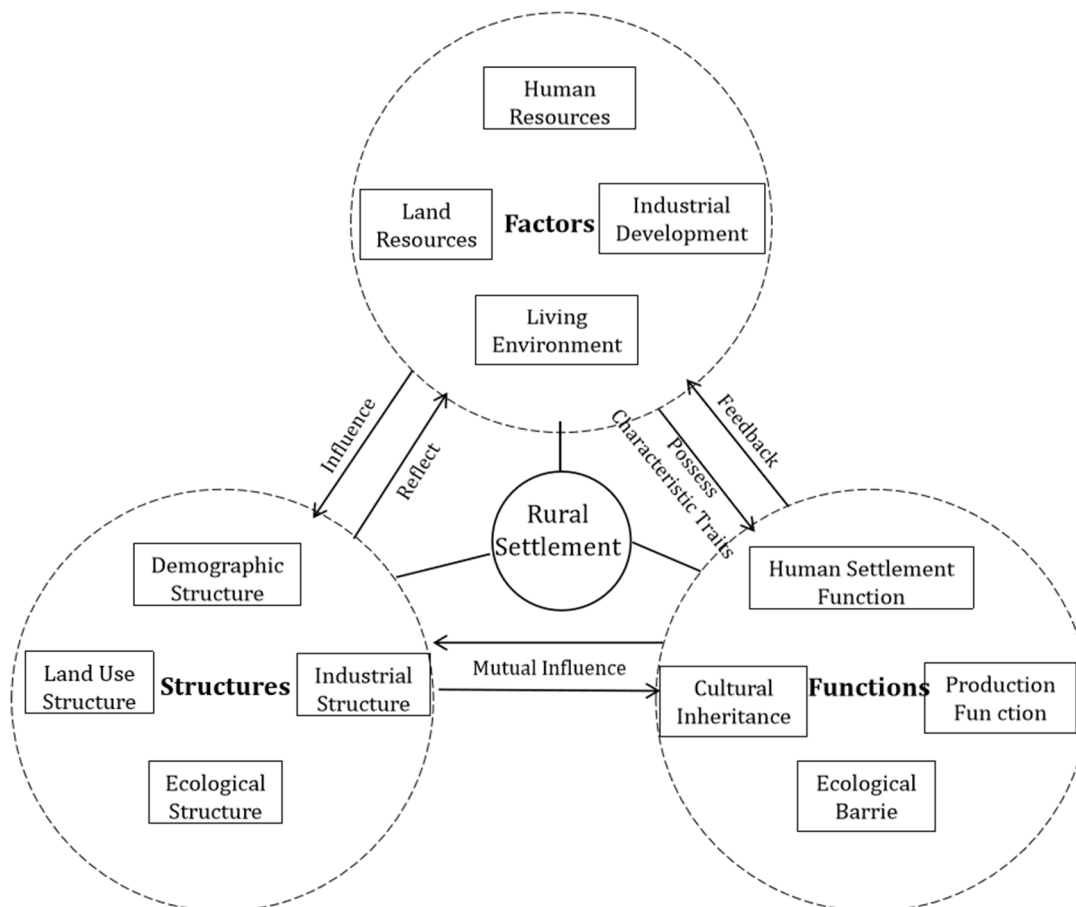


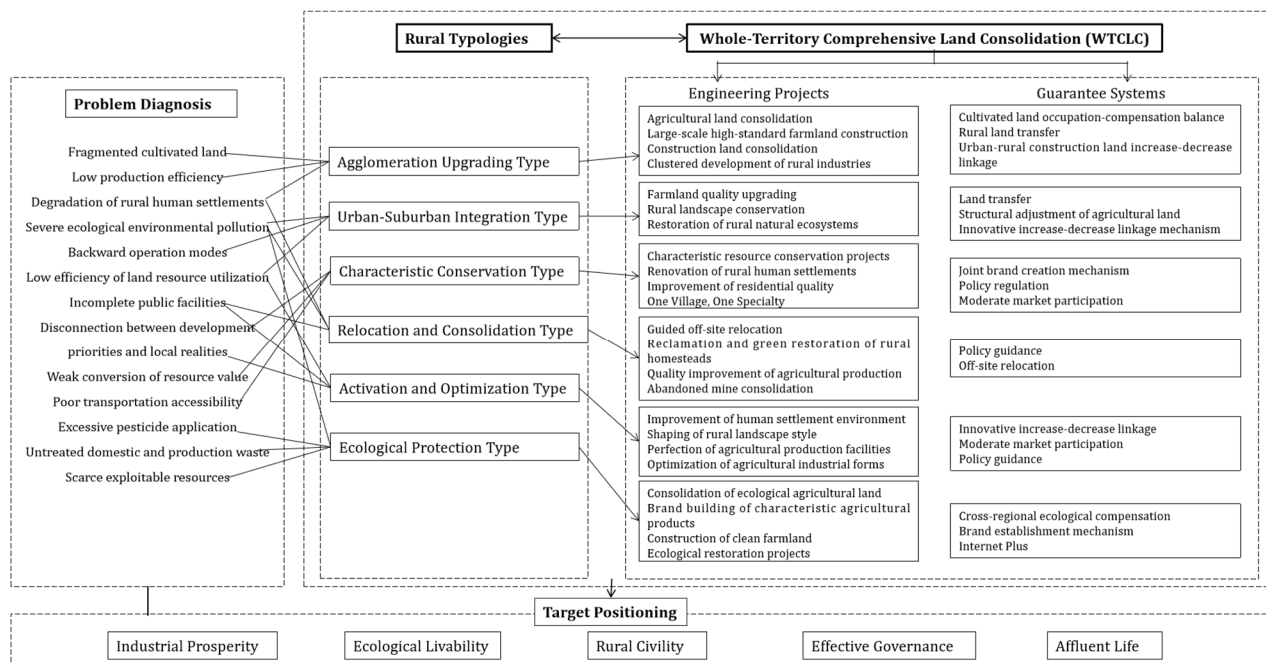
Figure 1. Mutual Feedback Framework of Rural Factors-Structures-Functions

3.2. Logical Correlation Between Diversified Rural Typologies and Whole-Territory Comprehensive Land Consolidation

Based on the above analysis, rural development presents prominent heterogeneity. Starting from the inherent development demands of villages, this study takes "industrial prosperity, ecological livability, rural civility, effective governance and affluent life" as the ultimate goal[2,5]. Considering the differentiated functions of basic rural elements within rural territorial spaces, this paper conducts targeted problem diagnosis for the actual conditions of each rural type, puts forward matched engineering projects and supporting guarantee systems, and establishes the internal logic chain of "target positioning –problem diagnosis" for whole-territory comprehensive land consolidation oriented by village typologies (Figure 2). This research intends to theoretically elaborate the inherent logic behind the necessity and feasibility of differentiated whole-territory comprehensive land consolidation practices.

Table 2. Rural Typology Classification Results

Rural Typology	Typological Connotation
Agglomeration Upgrading Type	Refers to central villages and key villages with large existing scales and favorable development conditions, as well as other ordinary villages that will remain in operation in the future, serving as the priority carriers of rural revitalization. Characteristics: Relatively abundant cultivated land resources, concentrated human resources, and strong attraction to surrounding areas. Development Orientation: Vitalize industries, subdivide industrial categories, optimize living environments and boost rural vitality; clarify specific economic functions matched with industrial factors.
Urban-Suburban Integration Type	Refers to villages on the outskirts of cities and surrounding county seat towns. They possess advantages to become the "city's backyard garden" and hold conditions for urban transformation. Characteristics: Obvious locational superiority, prominent radiation-driven effects from cities, high population mobility, and a large proportion of non-agricultural construction land. Development Orientation: Strengthen capacity to serve urban development, undertake overflow urban functions, realize interconnected infrastructure and co-built shared public services, and advance integrated urban-rural development.
Characteristic Conservation Type	Refers to villages endowed with abundant distinctive natural or historical cultural resources and distinct regional features. Characteristics: Unique historical, cultural or landscape resources endow villages with strengths in rural protection and tourism development, bearing the mission of cultural heritage inheritance. Development Orientation: Protect traditional village sites, layouts, rural styles and cultural relics; improve infrastructure and public environments on the premise of protection, and pursue moderate development to form a positive mutual promotion mechanism between characteristic resource conservation and village development.
Relocation and Consolidation Type	Refers to villages unfit for habitation due to harsh living conditions, fragile ecological environments, frequent natural disasters and inconvenient regional transportation, villages requiring relocation for major project construction, and "hollow villages" suffering severe population loss. Characteristics: Severe population outflow, inferior cultivated land resources, weak ecological carrying capacity, and generally lacking conditions for rural revitalization. Development Orientation: Carry out relocation and consolidation in accordance with villagers' willingness; implement targeted wasteland reclamation and green restoration on original village sites to optimize rural production and ecological spaces.
Activation and Optimization Type	Refers to ordinary villages with indistinct current development features, average location conditions and unremarkable resource advantages, yet destined to sustain long-term operation. Characteristics: No obvious strengths or weaknesses in cultivated land, human, ecological resources and public service facilities; further assessment is required for resource endowments and development potential. Development Orientation: Activate core rural development factors via industrial integration and land transfer; revitalize inefficient land, identify dominant functions, and lay a foundation for subsequent development.
Ecological Protection Type	Refers to villages located within ecological protection redlines, scenic areas, or ecologically sensitive and fragile zones. Characteristics: Poor location and transportation conditions, sound ecological environment, and industrial development restricted by ecological protection requirements. Development Orientation: Retreat partial construction land to satisfy ecological protection demands, secure a public service facility system to guarantee basic living needs, and sustain traditional industries compliant with ecological protection bottom lines.

**Figure 2.** Internal Logic Diagram of "Target Positioning-Problem Diagnosis" for Whole-Territory Comprehensive Land Consolidation Based on Village Typologies

3.3. Logical Model for Differentiated Consolidation Based on "Consolidation Potential-Consolidation Demand" of Whole-Territory Land and Rural Typologies

The foregoing analysis reveals that substantial disparities exist in the internal logic of whole-territory comprehensive land consolidation (WTCLC) across different rural typologies, which verifies the necessity of carrying out differentiated WTCLC for villages of distinct types. Although the classification framework covering six rural typologies has been established, the differentiated implementation paths of WTCLC still need further adaptation according to the gaps in consolidation potential and practical demands of individual villages. From the perspective of supply-demand matching, this study integrates consolidation demand and consolidation potential, and constructs a classified implementation framework applicable to rural whole-territory comprehensive land consolidation (Figure 3). Consolidation demand refers to the precise identification of consolidation demands by analyzing rural typologies, accurately grasping the current status of rural production-living-ecological spaces[19-20], and bench-marking against the standardized project contents of whole-territory comprehensive land consolidation. Consolidation potential refers to the established potential measurement framework and corresponding potential zoning, which takes rural resource endowments as the foundation and incorporates multiple restrictive factors including population, economy, society, culture, technology and institutions of each village.

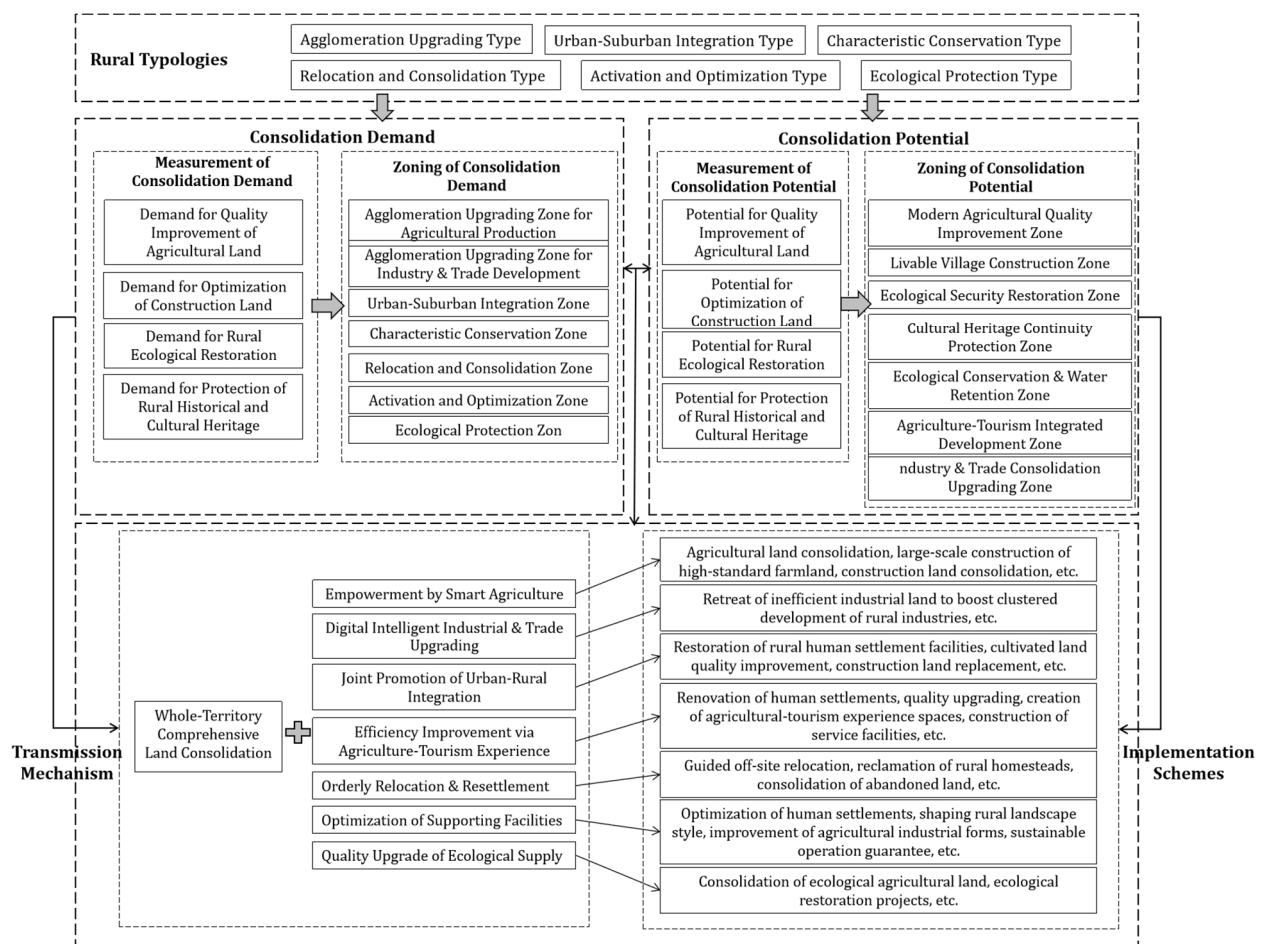


Figure 3. Classified Implementation Framework Diagram of Rural Whole-Territory Comprehensive Land Consolidation

The specific research workflow is as follows. First, calculate the consolidation demand of each administrative village of different rural typologies. Based on demand details, villages with consolidation demands are subdivided into seven consolidation demand zones: agglomeration upgrading zone for agricultural production, agglomeration upgrading zone for industry and trade development, urban-suburban integration zone, characteristic conservation zone, relocation and consolidation zone, activation and optimization zone, and ecological protection zone, to clarify the key priorities of regional consolidation and development. Second, conduct consolidation potential measurement covering agricultural land quality improvement, construction land optimization, rural ecological restoration, and rural historical and cultural protection. The advantage discrimination method[20] is commonly adopted; if quantitative data are available, the indicator weighting method can be applied for detailed measurement. Villages with consolidation potential are classified into seven consolidation potential zones: modern agricultural quality improvement zone, livable village construction zone, ecological security restoration zone, cultural heritage continuity protection zone, ecological conservation and water retention zone, agriculture-tourism integrated development zone, and industry-trade consolidation upgrading zone, highlighting the core advantages of each rural type. Finally, adopt spatial overlay analysis. Based on the spatial overlay and matching results of consolidation demand and consolidation potential, seven differentiated practical paths for whole-territory comprehensive land consolidation are proposed, namely: land consolidation empowered by smart agriculture, land consolidation with digital intelligent industrial and trade upgrading, land consolidation boosting urban-rural integrated development, land consolidation raising efficiency via agricultural-tourism experience, land consolidation supporting orderly relocation and residential settlement, land consolidation optimizing ecological supply via supporting facilities, and land consolidation improving ecological supply quality. These seven paths comply with the requirements of the rural revitalization strategy, reflect rural comparative advantages, satisfy local development demands, and achieve deep integration with cutting-edge digital and interconnected technologies.

4. Conclusion

Against the dual context of the rural revitalization strategy and whole-territory comprehensive land consolidation (WTCLC), this study takes the mutual feedback system of "factors-structures-functions" as its theoretical foundation. Based on the fundamental attribute that villages constitute complex dynamic systems and combined with existing rural classification research results, this paper divides China's villages into six categories: agglomeration upgrading type, urban-suburban integration type, characteristic conservation type, relocation and consolidation type, activation and optimization type, and ecological protection type. The coupling logic of whole-territory comprehensive land consolidation varies distinctly across different rural typologies. In the future, it is urgent to carry out differentiated WTCLC practices following the analytical framework of "target positioning – problem diagnosis". From the supply-demand matching perspective and combined with rural typology division, this study further refines the differentiated transmission mechanisms and corresponding implementation schemes, which specifically include seven integrated development modes: land consolidation empowered by smart agriculture, land consolidation with digital intelligent industrial and trade upgrading, land consolidation facilitating urban-rural integrated development, land consolidation boosting efficiency through agricultural-tourism experience, land consolidation supporting orderly relocation and resettlement, land consolidation optimizing ecological supply via supporting infrastructure, and land consolidation improving the quality of ecological supply.

Endowed with inherent regional roots, social textures and cultural veins, rural revitalization features growing complexity in its implementation. It relies not only on the rigid reconstruction of physical spaces, but also on the flexible operation and maintenance of organizational governance; neither component can be omitted. Looking ahead, it is essential to establish a full-process guarantee system for whole-territory comprehensive land consolidation (WTCLC). Targeted differentiated technical guidelines for consolidation shall be formulated to clarify typology-specific technical specifications based on the matching relationship between consolidation demand and consolidation potential. Hierarchical and categorized policy supply should be advanced covering core dimensions including land use regulation, industrial support, ecological protection and local cultural inheritance. Diversified collaborative participation mechanisms for multiple stakeholders shall be correspondingly matched to break capital bottlenecks and smooth the flow of land resources and production factors. Furthermore, a dynamic long-term governance and control mechanism needs to be constructed. In response to phased characteristics of population shifts, industrial evolution and ecological spatial patterns, rural typology division and target positioning shall be dynamically adjusted. Specialized evaluation indicators shall be developed for each consolidation module, so as to deliver systematic institutional safeguards for differentiated whole-territory comprehensive land consolidation in villages.

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