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Towards Stringent Ecological Protection and Sustainable Spatial Planning: Institutional Grammar Analysis of China's Urban–Rural Land Use Policy Regulations

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Abstract

Emerging hybrid governance models are transforming conventional approaches to land-use regulation by simultaneously enabling urban–rural development and enforcing ecological safeguards. This study investigates the regulatory mechanisms underpinning China's urban–rural land-use policies through an innovative mixed-methods approach, integrating systematic text analysis and the Institutional Grammar Tool (IGT). Drawing on a comprehensive dataset of 62 national policy documents (2012–2024), we employ textual coding and thematic clustering to identify seven core policy pathways, ranging from territorial spatial planning to ecological protection. These pathways are further deconstructed using IGT to assess their regulatory intensity, revealing a tripartite governance model: (1) flexible AIC-strategies (e.g., land market mechanisms), which enable local experimentation by specifying actors, aims, and conditions without rigid obligations; (2) adaptive ADIC-norms (e.g., collective land reforms), which balance central directives with localized discretion through conditional deontic rules; and (3) rigid ADICO-rules (e.g., ecological redlines), which enforce absolute compliance through binding sanctions. Through systematic analysis of land use policy regulations, we reveal how China's hybrid governance system operationalizes a tripartite institutional logic—maintaining rigid regulatory control (ADICO-rules) in ecologically critical zones, adaptive policy experimentation (ADIC-norms) in transitional areas, and flexible market-based instruments (AIC-strategies) in development zones—thereby dynamically reconciling environmental conservation with socioeconomic diversification. The study advances both institutional theory through its grammatical analysis of policy instruments and governance theory by transcending the traditional command-and-control versus flexible governance dichotomy. Practically, the research offers actionable insights for policymakers in emerging economies, emphasizing spatially differentiated regulation, dynamic monitoring system, and strategic coupling of binding rules with flexible implementation mechanisms.

Keywords: ecological civilization; spatial planning; land; sustainable development; policy; governance; regulation



Academic Editors: Piyush Tiwari and Dingde Xu

Received: 13 August 2025

Revised: 8 September 2025

Accepted: 15 September 2025

Published: 16 September 2025

Citation: Chen, Y.; Zhou, C.; Richardson-Barlow, C. Towards Stringent Ecological Protection and Sustainable Spatial Planning: Institutional Grammar Analysis of China's Urban–Rural Land Use Policy Regulations. *Land* **2025**, *14*, 1896. <https://doi.org/10.3390/land14091896>

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1. Introduction

The escalating impacts of climate change and biodiversity loss have created unprecedented challenges for global sustainable development [1], compelling nations to adopt

innovative land-use regulatory frameworks [2]. A growing body of evidence highlights the urgent need to balance economic development with stringent ecological protection, particularly in fast-urbanizing regions [3]. Current patterns of urban expansion and rural transformation are exerting immense pressure on ecosystems, necessitating robust regulatory policies that can reconcile developmental and environmental objectives. This global challenge calls for a deeper understanding of how regulatory policy can enforce ecological priorities while accommodating sustainable spatial planning needs [4]—a tension acutely manifested in China’s rapid urbanization context.

Against this backdrop, China’s urban–rural land use policy framework represents a pioneering experiment in operationalizing stringent environmental governance [5]. Unlike conventional zoning approaches, China’s framework integrates legally binding ecological boundaries with adaptive policy pathways, offering a unique hybrid model of top-down targets and localized implementation. While international systems like Germany’s Landscape Planning Framework emphasize participatory spatial planning [6], China’s approach stands out through its unique integration of centralized coordination with localized adaptation, effectively combining national-level ecological targets with province-specific implementation mechanisms. This architecture provides critical insights into how emerging economies might design governance systems to address sustainability dilemmas at the urban–rural interfaces.

Despite growing scholarly attention, critical gaps persist in understanding the policy regulation of China’s land use framework. Existing literature has predominantly focused on either ecological outcomes—such as habitat conservation effectiveness and species protection metrics [7]—or implementation challenges at the local level, particularly conflicts between conservation objectives and economic development priorities [8]. However, these studies have largely neglected the institutional design that enables stringent ecological protection and sustainable spatial planning.

This paper seeks to address these knowledge gaps through an analytical framework that combines policy text analysis with institutional grammar analysis. Our research objectives are threefold: first, to map the diverse pathways that constitute China’s land use policy framework through comprehensive text analysis of central policy documents; second, to decode the nuanced regulatory mechanisms embedded in these policies using the Institutional Grammar Tool (IGT), which allows for systematic dissection of the land use regulatory policies; third, to contribute to broader institutional theory by elucidating how hybrid governance regimes like China’s strategically combine hierarchical command-and-control mechanisms with localized flexibility—a regulatory model with significant implications for other Global South contexts grappling with similar sustainability challenges.

This study makes three contributions to the literature on land governance:

- First, it develops an analytical framework that bridges policy text analysis with institutional grammar tools (IGT) to systematically decode China’s hybrid regulatory architecture—a methodological advancement that addresses the current scholarly neglect of policy design mechanisms in land-use studies. While existing research has predominantly focused on ecological outcomes or local implementation challenges, few have dissected how regulatory instruments are grammatically constructed to balance flexibility and stringency. By applying IGT to 62 national policies, we reveal how China strategically deploys AIC, ADIC, and ADICO configurations across pathways, offering the first empirical taxonomy of regulatory intensity in land-use governance.
- Second, the study advances institutional theory by elucidating China’s distinctive calibrated rigidity approach to sustainability governance. Prior comparative studies have emphasized participatory models, overlooking how hierarchical systems like China’s integrate adaptive elements. We demonstrate that China’s system uniquely

combines top-down ecological redlines (ADICO-rules) with localized experimentation (AIC-strategies), challenging the false dichotomy between command-and-control and flexible governance. This hybrid model, operationalized through grammatical variations in policy texts, provides a blueprint for emerging economies facing similar urbanization-environment tensions.

- Third, the research provides critical insights into the policy design principles that enable simultaneous achievement of ecological protection and development goals. Existing studies often treat these objectives as trade-offs, failing to examine how regulatory architecture can reconcile them. Through our IGT analysis, we identify three key design principles: (1) spatially targeted application of regulatory stringency based on ecological sensitivity, (2) strategic coupling of binding rules with flexible implementation mechanisms, and (3) dynamic monitoring systems that maintain policy coherence while allowing local adaptation. These findings offer policymakers a framework for designing land-use governance systems that can balance environmental and developmental priorities in diverse contexts, moving beyond theoretical debates to practical solutions grounded in institutional grammar analysis.

Following this introduction, Section 2 provides a comprehensive review of China's land use policy system. Section 3 details the policy data collection, methods of text analysis and IGT. Section 4 presents findings on land use system. Section 5 discusses implications for land use regulation globally, and Section 6 concludes with limitations and future research.

2. Literature Review

The literature review of this research is divided into two aspects: (1) the China's urban–rural land use policy, and (2) the research gaps and theoretical opportunities.

2.1. China's Urban–Rural Land Use Policy: Evolution and Innovations

China's urban–rural land use regulation system has evolved as a critical instrument for achieving stringent ecological protection and sustainable spatial planning needs. Emerging from the Ecological Civilization framework, this system integrates legally binding controls—such as the Ecological Protection Red Lines (EPRL)—with adaptive governance mechanisms to balance protection and development [9]. Scholarly research highlights its hybrid nature: national-level mandates set quantitative targets (e.g., minimum conservation areas), while provincial and local governments tailor implementation through zoning adjustments and incentive-based compliance tools.

The existing literature has primarily examined three key dimensions of this system. First, the EPRL mechanism represents a paradigmatic shift in protection governance, establishing legally binding spatial boundaries with strict enforcement measures [10]. Second, the national land spatial planning system has institutionalized a multi-layered regulatory approach that integrates ecological protection and regional development within a unified governance framework [11]. Third, local implementation has demonstrated remarkable policy innovation, with provinces developing market-based compensation mechanisms and piloting flexible boundary adjustment protocols [12].

While these studies provide valuable insights into specific policy instruments and their outcomes, they often operate in disciplinary silos. Environmental governance literature extensively documents the ecological effectiveness of redline policies, while planning studies focus on the spatial integration of multi-level plans, and economic research analyzes the efficiency of market mechanisms. This fragmented approach has limited the development of a holistic understanding of how these diverse components interact within a unified, hybrid governance architecture. Furthermore, much of the existing scholarship tends to be

descriptive, cataloging policy innovations without sufficiently theorizing the underlying institutional mechanisms that enable such hybridity.

Recent scholarship has begun to explore the operational dynamics of this system, particularly how it mediates between central government mandates and local implementation realities. Studies have documented successful cases where the regulatory framework has effectively prevented urban encroachment into ecologically sensitive areas, while also highlighting persistent challenges in reconciling conservation objectives with rural development needs [13].

The Chinese land use regulation system's uniqueness lies in its multi-scalar governance design. In contrast to Western land-use planning paradigms that prioritize deliberative democracy and stakeholder participation (exemplified by Germany's Landscape Planning framework) [6], the Chinese model articulates a unique synthesis of hierarchical regulatory rigor and localized policy innovation. This dualistic governance architecture—characterized by its simultaneous deployment of centralized command-and-control mechanisms and subnational implementation flexibility—constitutes a theoretically significant divergence from conventional land-use governance typologies, meriting systematic comparative analysis vis-à-vis global institutional alternatives.

Furthermore, while this study focuses on China's distinctive model, its analytical framework offers significant potential for comparative analysis with other Global South nations facing similar urbanization-environment tensions. For instance, India's environmental governance, characterized by a robust judicial activism that creates 'green norms' yet struggles with decentralized implementation [14], presents a compelling contrast to China's centralized yet adaptive hybrid system. Similarly, Brazil's Amazon protection policies, which oscillate between strict federal mandates and local developmental pressures, highlight a different set of challenges in balancing ecological and economic goals [15]. China's approach—with its explicit grammatical structuring of rigidity and flexibility through national policy instruments—provides a novel counterpoint to these models. It demonstrates an alternative pathway to hybrid governance that is primarily administratively engineered rather than judicially mediated or politically contested. This comparative perspective remains underexplored in the literature and represents a critical gap that the methodology of this study can help address, thereby reinforcing its global applicability.

2.2. Critical Research Gaps and Theoretical Opportunities

Despite growing academic interest, significant limitations persist in current understanding of China's land use regulation system. The aforementioned fragmentation in the literature leads to three specific, interconnected gaps that this study aims to address.

A fundamental gap exists in systematic, text-based analysis of the policy architecture itself. While numerous studies have examined implementation outcomes [9–11], few have undertaken comprehensive text analysis of the regulatory documents that constitute the policy framework. This neglect is particularly striking given the system's reliance on formal policy instruments to articulate and enforce land-use controls. There remains no scholarly consensus on how to categorize or analyze the diverse policy pathways embedded in China's land use regulations, nor how these pathways interact across different administrative levels.

Equally problematic is the lack of empirical assessment of regulatory intensity within this system. Current literature fails to provide robust methodologies for measuring or comparing the regulatory stringency of different land-use policy pathways, despite frequent policy claims about strengthening ecological protection. The absence of systematic evaluation makes it difficult to assess whether regulatory measures actually achieve their intended levels of control, or how stringency varies across spatial contexts and policy do-

mains. This gap fundamentally limits our ability to understand the system's effectiveness as a tool for sustainable spatial planning.

Most crucially, there is a theoretical gap in understanding how China's hybrid model operates at the regulatory level. While the concept of hybrid governance is frequently invoked, the precise institutional mechanisms that enable the simultaneous operation of rigid and flexible elements remain underexplored. Little is known about how specific policy instruments grammatically construct this hybridity to balance central control with local discretion.

These methodological shortcomings have constrained theoretical advancement in several ways. First, they prevent comprehensive understanding of how China's hybrid governance model actually operates at the regulatory level. Second, they limit meaningful comparative analysis with international land-use governance systems, particularly with other Global South contexts like India and Brazil. Without a granular understanding of the institutional grammar that constitutes China's model, comparisons risk remaining at a superficial level of policy outcomes or political structures, rather than engaging with the deeper regulatory mechanisms that enable hybridity. This gap inhibits the development of a truly global theory of sustainability governance that can account for diverse institutional pathways in the Global South. Third, they constrain development of middle-range theories that could explain the relationship between regulatory design and governance outcomes in different spatial contexts.

This study addresses these gaps through an innovative two-stage analytical approach. First, we employ systematic text analysis to map and categorize the policy pathways within China's land use regulation framework, examining how regulatory requirements are articulated across different policy documents and administrative levels. Second, we apply the Institutional Grammar Tool (IGT) to conduct the first empirical assessment of regulatory stringency in this context, analyzing how rules are constructed and enforced through specific grammatical configurations. By combining these methods, we bridge the descriptive-theoretical divide, moving beyond cataloging policy features to systematically decoding the institutional grammar that underpin China's distinctive approach to land-use governance. Our analysis pays particular attention to how varying degrees of regulatory intensity are deployed across different spatial contexts and policy pathways, offering new insights into the hybrid governance of urban–rural land systems.

3. Data and Methods

This section encompasses two areas: (1) policy data collection, and (2) the mixed-methods approach that methodologically combines the text analysis and the IGT.

3.1. Policy Data

This study centers on national-level policy documents that establish the foundation of China's urban–rural land use regulatory framework. We systematically collected 62 core policy instruments issued by central government bodies, including laws promulgated by the National People's Congress, administrative regulations from the State Council, and governmental directives from the Ministry of Natural Resources and other related agencies. The dataset spans from 2012 to 2024, covering the critical period of China's Ecological Civilization institutional reforms and the establishment of the national territorial spatial planning system.

The document collection prioritized authoritative sources that define the fundamental regulatory architecture of China's land use governance, including: (1) foundational laws such as the Land Administration Law (2019 revision) [16]; (2) national spatial planning documents like the National Territorial Spatial Planning Outline (2021–2035) [17];

and (3) specialized regulations including the Ecological Protection Red Line Management (2022) [18]. All texts were sourced from the Central People's Government policy database and the Ministry of Natural Resources official portal, ensuring authenticity and legal validity.

This nationally focused dataset enables systematic analysis of how China's central government structures its land use policy system, particularly in promoting stringent ecological protection objectives and sustainable spatial planning requirements. By concentrating on top-level policy instruments, we maintain analytical consistency while capturing the essential regulatory logic that provincial and local implementations must follow. The documents were processed as structured text corpora, preserving original legal terminology and regulatory provisions for detailed textual and institutional grammar analysis.

Despite these methodological strengths, this study's macro-level policy corpus collection has inherent limitations. By focusing exclusively on national-level policy documents, this study intentionally prioritizes analytical depth and consistency in decoding the central government's regulatory architecture. However, this design choice necessarily omits the vast corpus of provincial and municipal regulations, which may introduce local innovations, interpretations, or implementation details that could modify the *de facto* regulatory intensity at the local level. This limitation means our analysis captures the 'designed' grammatical structure of the system at the apex, but future research incorporating sub-national policy data could provide a more complete picture of its implemented grammar.

3.2. Methods

To address the research gaps identified in Section 2.2, this study employs an innovative mixed-methods framework that integrates systematic text analysis with Institutional Grammar Tool (IGT) coding. The combination of these methods is theoretically grounded in two complementary needs: (1) the necessity to holistically map China's complex land-use policy pathways (best captured through thematic text analysis), and (2) the requirement to rigorously decode the nuanced regulatory mechanisms embedded within these policies (enabled by IGT's grammatical deconstruction).

This methodological synergy enhances robustness through complementary validation—where text analysis identifies 'what' policy instruments exist, while IGT reveals 'how' they institutionally operate. Specifically, the text analysis phase employs NVivo-assisted coding to categorize policy documents into thematic clusters, establishing the macroscopic architecture of China's land-use governance system. This macroscopic mapping alone, however, would insufficiently capture the regulatory intensity variations critical to understanding China's hybrid governance model. Here, IGT provides the microscopic analytical lens: its syntactic dissection of policy clauses (into AIC/ADIC/ADICO components) quantifies gradations of rigidity/flexibility that traditional content analysis cannot detect. The selection of IGT is further justified by its unique capacity to operationalize theoretical concepts of institutional hybridity. Unlike conventional policy analysis tools, IGT's grammatical formalism allows systematic comparison of regulatory stringency across disparate policy domains.

(1) Text Analysis for Policy Pathway Identification

Building upon existing scholarly research on text analysis methodologies [19,20], our approach employed a rigorous multi-stage process to systematically identify pathways within China's urban–rural land use policy framework. The research team, consisting of three trained coders with expertise in Chinese land policy and environmental governance, first conducted an extensive review of existing policy analysis literature to develop a theoretically grounded coding framework.

The analysis encompassed all 62 national policy documents in our dataset, which were carefully processed into standardized text formats while preserving original legal

terminology, hierarchical structures, and contextual nuances. Prior to full coding, the team conducted an initial pilot analysis of 10% of documents (randomly selected) to establish intercoder reliability, achieving a Cohen's score of 0.91, indicating substantial agreement. The formal coding process then proceeded with each document being independently analyzed by three researchers using NVivo 14 software, with weekly reconciliation sessions to discuss and resolve coding discrepancies, refine definitions, and ensure consistent application of the coding framework.

Through this analytical process, we initially identified 21 distinct policy clusters, which were subsequently consolidated into 7 primary pathways based on their policy characteristics and functional alignment. This consolidation was informed by both quantitative measures of conceptual similarity and qualitative assessments of policy intent and implementation mechanisms [21]. The final pathway typology underwent rigorous validation through consultations with five Chinese land use policy experts, including two former government officials involved in policy formulation and three academic specialists in land governance. This validation process achieved 93% consensus on classification accuracy and provided valuable insights for refining our analytical framework. These methodological safeguards helped mitigate potential biases and strengthened the validity of the research findings [22]. The resulting comprehensive text analysis not only maps the diverse pathways within China's land use policies but also establishes a foundation for subsequent institutional grammar analysis of the regulatory mechanisms through these policy pathways.

(2) Institutional Grammar Tool (IGT) Analysis of Policy Regulations

Building upon the policy pathways identified through text analysis, we employed the Institutional Grammar Tool (IGT) to systematically deconstruct the regulatory mechanisms embedded in China's urban–rural land use policies. The IGT, originally developed by Crawford and Ostrom (1995) [23] and subsequently refined by Basurto et al. (2010) [24] and Siddiki et al. (2011, 2022) [25,26], provides a rigorous framework for analyzing regulatory policy statements by breaking them down into five core grammatical components [27]:

- (a) Attributes (A): Identifies the actors, either individuals or groups such as central governments, sub-national governments, NGOs, or corporates, responsible for implementing policies.
- (b) Deontic (D): Specifies the prescriptive aspects of policy implementation, using terms like 'must (not)', 'should (not)', or 'may (not)' to express permissions, obligations, or prohibitions.
- (c) Aim (I): Highlights the primary goal or action that the policy intends to achieve.
- (d) Condition (C): Specifies the conditions under which the policy actions are applicable, including procedural, temporal, spatial, and other relevant contexts.
- (e) Or Else (O): Details the repercussions or sanctions for failing to comply with the policy.

The IGT application process involved three key phases. First, we trained a team of three researchers with expertise in land policy and institutional analysis to consistently identify and code these components across all policy documents. Each regulatory statement was classified into one of three configurations [28]:

- (i). AIC-strategies, which include Attributes (A), Aim (I), and Condition (C) but lack Deontic (D) and Or Else (O) elements, are seen as having lower regulatory impact but greater implementation flexibility.
- (ii). ADIC-norms add a Deontic component (D), increasing normative pressure and compliance incentives compared to AIC.

- (iii). The most comprehensive, ADICO-rules, encompass all five elements, including explicit sanctions (Or Else), making them the most binding and enforceable regulatory form with the highest compliance rates.

This classification system allowed us to quantitatively assess regulatory stringency and the potential implementation flexibility across different policy pathways. To ensure analytical rigor, we implemented multiple validation measures [29]. The research team independently coded 20% of the policy statements, achieving an initial intercoder reliability of 0.85, with remaining discrepancies resolved through consensus-building discussions. We further validated our coding framework through consultations with five experts in Chinese land governance, including two former government officials.

The IGT analysis provides unprecedented insights into how China’s land use policies operationalize the balance between stringent ecological protection and sustainable spatial planning. By quantifying the distribution of AIC, ADIC and ADICO configurations across policy pathways, we establish an empirical foundation for understanding the system’s hybrid governance model—one that combines hierarchical control with localized flexibility through deliberate variations in land use policies.

4. Results

The results of this research are divided into two primary areas: (1) policy pathways and (2) the deconstruction of policy regulation within different land use pathways.

4.1. Policy Pathways in China’s Urban–Rural Land Use Governance

Through systematic text analysis of 62 national policy documents spanning 2012–2024, we identified seven core policy pathways that constitute China’s sophisticated land use governance framework (Table 1). These land use pathways collectively demonstrate how China operationalizes its “Ecological Civilization” vision through a carefully calibrated regulatory system that balances ecological protection with development needs. The pathways exhibit varying degrees of regulatory stringency and implementation flexibility, reflecting the government’s strategic approach to managing complex land use challenges across diverse regional contexts.

Table 1. Pathways in China’s urban–rural land use policy framework.

No.	Pathways	Sub-Pathways
1	Territorial Spatial Planning and Use Control	“Five-level, Three-category”, Multi-review Integration, Three Control Lines
2	Cultivated Land Protection and Quality Enhancement	Permanent basic farmland protection system, “Trinity” protection system, Cross-regional quota trading mechanism
3	Collective Land System Reforms	Collective-owned construction land marketization, Homestead land reform, Wasteland development
4	Construction Land Lifecycle Management	New construction land approval, Revitalization of existing construction land, Construction land standard control
5	Land Market Allocation Mechanisms	Land use “increase-decrease linkage” policy, Idle land disposition, land financing and bond
6	Ecological Protection and Restoration	Ecological protection redline system, Comprehensive land consolidation, Ecological compensation mechanisms
7	Special Zone Land Support	Land use guarantees for rural revitalization, Urban renewal land policies, Land policies for major strategic zones

(1) The first pathway, Territorial Spatial Planning and Use Control, serves as the overarching framework that coordinates all land use activities through a multi-layered governance system. At its core is the innovative “Five-level, Three-category” planning hierarchy that vertically integrates planning mandates from national to township levels while horizontally coordinating functional, special, and detailed plans. This pathway features several groundbreaking reforms, most notably the “Multi-review Integration” initiative that consolidated previously separate approval processes into a unified procedure, significantly reducing bureaucratic delays while maintaining rigorous oversight. The “Three Control Lines” mechanism represents another critical component, establishing legally binding spatial boundaries for ecological protection, agricultural security, and urban expansion. Advanced monitoring technologies including satellite remote sensing and big data analytics enable more dynamic and timely oversight of regulatory compliance, enhancing the potential for enforcement effectiveness for both ecological redlines and permanent basic farmland protections. This pathway exemplifies China’s top-down regulatory approach, characterized by clear quantitative targets, standardized implementation protocols, and strong compliance mechanisms.

(2) The Cultivated Land Protection and Quality Enhancement pathway demonstrates China’s innovative approach to ensuring food security while promoting sustainable agriculture. The permanent basic farmland protection system employs the strictest regulatory measures, categorically prohibiting non-agricultural use and requiring equivalent or higher quality replacement for any approved conversions. Recent policy innovations have expanded protection from purely quantitative targets to encompass quality and ecological dimensions, creating a comprehensive “Trinity” protection system. Market mechanisms like cross-regional quota trading have been introduced to optimize resource allocation, allowing economically developed regions to compensate agricultural regions for maintaining cultivation capacity. The pathway’s design cleverly combines command-and-control measures with economic incentives, achieving both high compliance rates and flexibility to accommodate necessary development adjustments.

(3) Collective Land System Reforms represent China’s bold experimentation with market-oriented rural land governance. The Collective-owned construction land marketization has fundamentally transformed rural land rights, enabling direct market transactions while maintaining collective ownership. This reform has been particularly impactful in urban fringe areas, where collective land has become an important resource for industrial parks and affordable housing. The homestead land reform represents another significant innovation, separating ownership, qualification, and use rights to activate dormant rural assets. Parallel reforms in wasteland development have created new value from previously marginal lands through market-based allocation mechanisms. These reforms collectively demonstrate China’s distinctive approach to land system innovation—carefully controlled experimentation through pilot programs, followed by phased nationwide rollout contingent on demonstrated success. The pathway’s design intentionally maintains greater flexibility to accommodate local adaptation and innovation.

(4) The Construction Land Lifecycle Management pathway addresses the critical challenge of balancing development needs with resource constraints. Its regulatory framework spans the entire land development process, from initial approval to post-construction supervision. The pathway introduces differentiated controls based on project type and location, with streamlined approvals for national strategic projects and stricter scrutiny for conventional development. A particularly innovative element is the “pre-approval with post-verification” mechanism for major infrastructure, which accelerates project initiation while ensuring eventual compliance. For existing urban areas, the pathway emphasizes intensive reuse of stock land through flexible zoning adjustments and economic incentives.

Sector-specific land use standards further promote efficient utilization by establishing binding intensity targets. This pathway's design exemplifies pragmatic flexibility, employing varying degrees of stringency based on developmental priorities and land use contexts.

(5) Land Market Allocation Mechanisms represent China's hybrid approach to reconciling state planning with market forces. The land use "increase-decrease linkage" policy creates a unique market for development rights, allowing regions facing land constraints to purchase quotas from areas with surplus rural construction land. This instrument has become particularly important for coordinating development between eastern coastal regions and central/western provinces. This pathway further institutionalizes a systematic mechanism for idle land disposition, aiming to fully unlock its latent economic and social value through comprehensive revitalization strategies. Recent innovations in land financing, including municipal bond mechanisms, have created new tools for funding urban regeneration.

(6) The Ecological Protection and Restoration pathway embodies China's commitment to environmental sustainability through legally binding conservation measures. The ecological redline system designates priority conservation areas covering nearly one-third of the country's territory, with strict prohibitions on incompatible activities. Monitoring data indicates consistently high compliance rates, supported by a comprehensive enforcement apparatus. The pathway also promotes proactive ecological improvement through holistic land consolidation projects that integrate agricultural, rural, and environmental objectives. Fiscal transfer payments and inter-regional compensation mechanisms provide financial incentives for conservation, creating a sustainable funding model for long-term environmental stewardship.

(7) Special Zone Land Support policies demonstrate China's place-based approach to addressing unique regional challenges. For rural areas, the pathway provides targeted flexibility in land use regulations to facilitate agricultural modernization and village revitalization. Urban renewal policies encourage intensive redevelopment through zoning incentives and streamlined approval processes. Major national strategic areas (e.g., Xiong'an National New Area) benefit from customized land policies that balance development needs with environmental protection. These spatially differentiated approaches allow China to maintain overall regulatory coherence while accommodating diverse local conditions and development priorities. The design of this policy pathway exhibits strategic variation contingent upon differentiated policy aims and contextual implementation factors.

4.2. Deconstruction of Policy Regulation Within Different Land Use Pathways

The Institutional Grammar Tool (IGT) analysis reveals a sophisticated spectrum of regulatory intensity across China's land use policy pathways, demonstrating how the government strategically calibrates governance approaches to balance national priorities with local implementation realities. Our findings identify three distinct regulatory configurations—AIC-strategies, ADIC-norms and ADICO-rules—each deployed with deliberate precision across different policy domains. This tripartite framework reflects China's innovative hybrid governance model, where varying degrees of central control and local flexibility are systematically applied based on the ecological sensitivity, developmental urgency, and political priority of each land use category. The quantitative distribution of these configurations (Table 2) provides empirical evidence for China's differentiated regulatory approach to land governance.

Table 2. Deconstruction results by IGT.

Pathways	Deconstruction Results		
	AIC	ADIC	ADICO
Territorial Spatial Planning and Use Control	41	49	32
Cultivated Land Protection and Quality Enhancement	32	36	41
Collective Land System Reforms	39	32	27
Construction Land Lifecycle Management	42	37	30
Land Market Allocation Mechanisms	48	31	26
Ecological Protection and Restoration	31	40	47
Special Zone Land Support	49	35	31

Note: In each row, we have bolded the most numerous AIC, ADIC, and ADICO to indicate that regulatory configurations dominate in that pathway. For example, in the Territorial Spatial Planning and Use Control pathway, ADIC has the most numerous, indicating that this pathway is dominated by ADIC-norms.

(1) AIC-Strategies: Enabling Local Adaptation through Flexible Policy Design

Our IGT analysis reveals that three key policy pathways predominantly employ AIC configurations, reflecting China’s strategic use of flexible governance mechanisms to encourage local innovation while maintaining broad policy direction. Construction Land Lifecycle Management (42 AICs), Land Market Allocation (48 AICs), and Special Zone Land Support (49 AICs) demonstrate the highest reliance on this approach, which specifies actors (A) and policy aims (I) while outlining implementation conditions (C), but deliberately omits explicit obligations (D) or sanctions (O).

This intentional design creates essential policy space for regional adaptation—particularly evident in Special Zone Land Support policies where municipal governments enjoy substantial discretion in applying national guidelines to local contexts. For instance, the “pre-approval with post-verification” mechanism in Construction Land Lifecycle Management allows provincial authorities to fast-track critical projects while maintaining eventual accountability through ex-post reviews. The prevalence of AIC configurations in market-oriented pathways underscores the central government’s deliberate strategy to stimulate local policy entrepreneurship, as demonstrated by the varied implementation of collective land marketization across different regions. Case studies from Guangdong’s land quota trading system and Zhejiang’s urban renewal programs illustrate how this flexibility has enabled successful policy innovations that were subsequently scaled nationally. However, our data also reveals that AIC-dominant pathways exhibit lower baseline compliance rates compared to more stringent configurations, suggesting that flexibility comes with implementation variability that requires careful central oversight.

(2) ADIC-Norms: Balancing Central Guidance with Regional Discretion

Two critical pathways operate primarily through ADIC-normative frameworks, representing an intermediate governance approach that balances direction with discretion: Territorial Spatial Planning and Use Control (49 ADICs) and Collective Land System Reforms (32 ADICs). These configurations introduce deontic operators (D)—typically “should” or “may”—creating stronger normative pressure than AIC strategies while avoiding the rigidity of full ADICO rules.

The Territorial Spatial Planning pathway exemplifies this adaptive approach, where the “Three Control Lines” mechanism combines binding quantitative targets with flexible implementation procedures, allowing provinces to adjust boundary delineations within nationally mandated thresholds. Similarly, Collective Land System Reforms employ ADIC norms to balance market activation with land ownership principles, as seen in the home-stead “three rights separation” reforms that permit usage right transfers while preserving collective ownership. Our compliance data shows these pathways achieve intermedi-

ate implementation rates—significantly higher than AIC-dominated pathways but below ADICO-regulated domains—demonstrating their effectiveness in accommodating regional diversity while maintaining policy coherence. The adaptive nature of these configurations is particularly evident in the spatial variation in implementation, with coastal provinces like Jiangsu leveraging ADIC norms to accelerate rural land marketization, while western regions prioritize gradual experimentation. This governance tier successfully mediates between central planning objectives and local economic realities, though it requires robust monitoring systems to prevent normative dilution during implementation.

(3) ADICO-Rules: Ensuring Compliance through Binding Regulatory Frameworks

The analysis identifies two policy domains where ADICO rules dominate, reflecting China's uncompromising stance on ecological and food security priorities: Cultivated Land Protection (41 ADICOs) and Ecological Protection (47 ADICOs). These complete regulatory formulations feature absolute deontics ("must/must not") coupled with detailed sanctions (O), creating unambiguous compliance imperatives that tolerate minimal deviation.

In the Ecological Protection Redline system, 89% of ADICO rules specify concrete penalties including project termination, administrative sanctions, and in severe cases, criminal liability for violations—a rigidity justified by the system's role in safeguarding 25% of China's terrestrial ecosystem. Similarly, Cultivated Land Protection employs ADICO rules to govern permanent basic farmland, requiring equivalent/higher quality replacement for any conversions and mandating State Council approval for adjustments. Our compliance monitoring shows these pathways maintain strong implementation adherence, though at significantly higher administrative costs than more flexible approaches. The stringent design is particularly evident in cross-regional enforcement mechanisms, where satellite surveillance combined with cadre evaluation systems ensure consistent nationwide adherence. This rigid governance tier demonstrates China's calibrated approach to regulatory stringency—reserving maximum control for systemically critical domains while permitting flexibility elsewhere. The ecological and agricultural sectors' near-exclusive use of ADICO rules reveals a deliberate policy choice to prioritize long-term sustainability over short-term developmental flexibility in these sensitive areas.

5. Discussion and Implications

The section now turns to systematically unpack the theoretical and practical implications of these findings. First, we examine how the IGT analysis advances theoretical contributions through China's hybrid governance model, followed by policy implications for emerging economies.

5.1. Theoretical Contributions of Hybrid Governance Mechanisms

China's urban–rural land use policy framework presents a groundbreaking case of regulatory hybridity, where the strategic interplay of flexible, adaptive, and rigid governance mechanisms achieves dual objectives of stringent ecological protection and sustainable spatial planning (Figure 1). Our Institutional Grammar Tool (IGT) analysis reveals a sophisticated tripartite system: AIC-strategies enable localized innovation through deliberate regulatory flexibility, ADIC-norms mediate central-local tensions via conditional obligations, and ADICO-rules enforce inviolable ecological and food security thresholds through uncompromising rigidity. This differentiated governance architecture challenges conventional policy dichotomies, demonstrating how varying degrees of regulatory intensity can be systematically deployed across spatial and functional domains. The framework's theoretical significance lies in its synthesis of institutional grammar analysis with sustainability governance, while its practical value emerges from scalable solutions to the universal tension between environmental protection and development needs. Below, we unpack

how each regulatory configuration operates as part of this integrated system, contributing distinct but complementary governance functions to China’s Ecological Civilization vision [30].

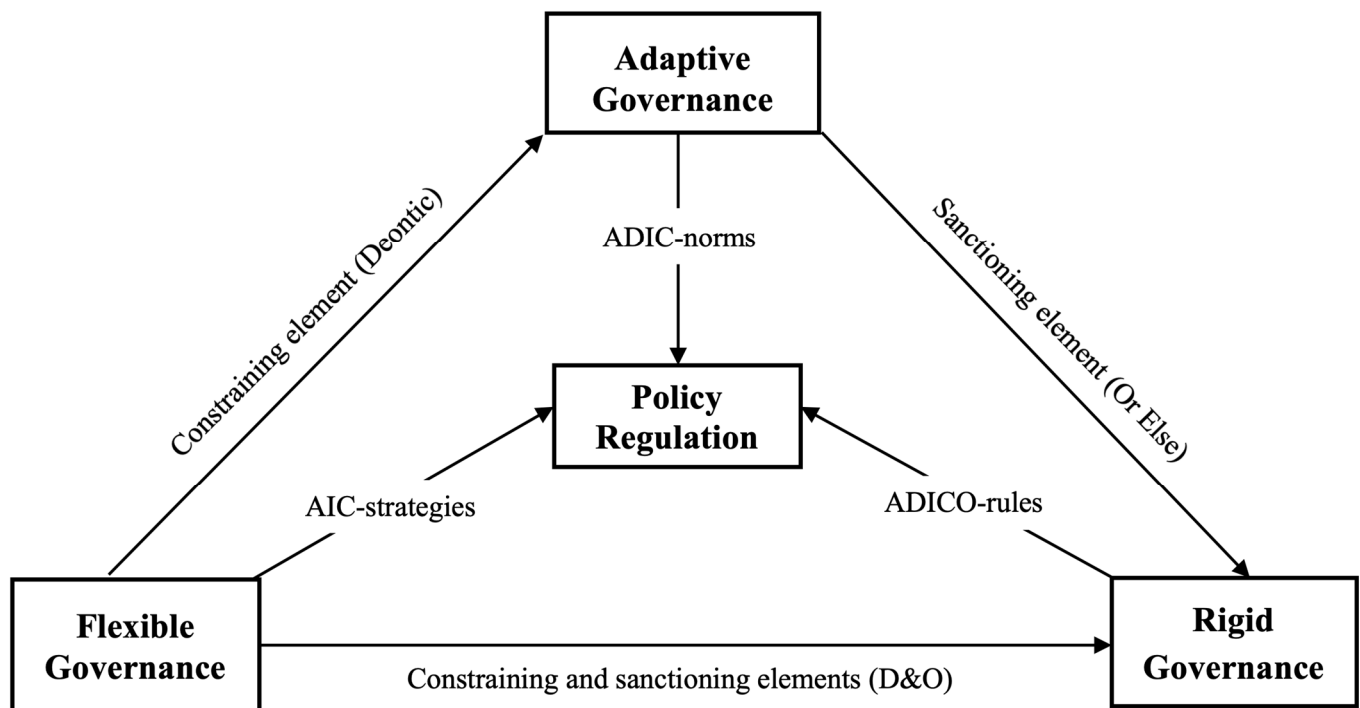


Figure 1. The hybrid regulatory architecture of land use policy framework.

(1) AIC-Strategies and Flexible Governance: Enabling Local Innovation for Sustainable Spatial Planning

The strategic deployment of AIC-strategies across China’s land use policy framework represents a sophisticated application of flexible governance principles to achieve sustainable spatial planning objectives. This configuration, characterized by the articulation of actors (A), aims (I), and conditions (C) while deliberately omitting deontic obligations (D) and sanctions (O), creates essential policy space for sub-national innovation. The theoretical underpinnings of this approach can be traced to Ostrom’s (1990) institutional analysis framework [31], which emphasizes the importance of locally adapted rules in managing common-pool resources. In China’s context, this flexibility has been particularly instrumental in addressing the complex trade-offs between ecological protection and urbanization pressures [32], enabling provinces like Guangdong and Zhejiang to develop context-specific solutions such as land development rights trading markets and eco-compensation schemes.

The experimental nature of AIC-dominant pathways aligns remarkably well with Gartlinger and Gualini’s (2025) framework of “experimental governance” [33], where local policy innovations serve as living laboratories for broader institutional evolution. For instance, the “increase-decrease linkage” policy in land market allocation allows economically developed regions to purchase development quotas from agricultural regions, creating a market-based mechanism that simultaneously protects farmland and supports urbanization. This echoes North’s institutional change theory [34], where incremental, bottom-up innovations gradually reshape formal rules. However, our findings reveal an important caveat: while AIC strategies foster innovation, they exhibit lower baseline compliance rates compared to more stringent configurations, highlighting the classic governance dilemma between flexibility and accountability.

China's innovative response to this challenge has been to embed AIC flexibility within a robust monitoring infrastructure. The integration of satellite remote sensing, big data analytics, and cadre evaluation systems creates a “flexibility with oversight” model that maintains policy coherence while allowing local adaptation. This hybrid approach offers important theoretical insights for the growing literature on sustainability transitions [35,36], demonstrating how flexible governance can be operationalized without compromising ecological redlines. From a practical standpoint, China's experience provides valuable lessons for developing nations seeking to balance rapid urbanization with environmental protection, particularly in demonstrating how market mechanisms can be harnessed to achieve sustainable spatial planning objectives.

(2) ADIC-Norms and Adaptive Governance: The Art of Balanced Regulation

ADIC-norms emerge as the cornerstone of China's adaptive governance approach, striking a delicate balance between central coordination and local discretion in land use regulation. This intermediate configuration, featuring actors (A), deontic operators (D), aims (I), and conditions (C) but omitting sanctions (O), creates what might be termed “guided flexibility”—a governance sweet spot that combines directional certainty with implementation adaptability. The theoretical significance of this finding lies in its contribution to the adaptive governance literature [37,38], particularly in demonstrating how formal institutions can incorporate learning mechanisms while maintaining regulatory coherence.

The operationalization of ADIC-norms in China's territorial spatial planning system offers a compelling case study in adaptive rigidity. The “Three Control Lines” mechanism establishes non-negotiable quantitative targets for ecological protection, agricultural security, and urban development, while allowing provincial and municipal governments substantial discretion in boundary delineation. This dual structure effectively addresses what Termeer et al. (2010) identified as the core challenge of adaptive governance: maintaining system stability while permitting necessary evolution [39]. Our analysis shows that ADIC-dominant pathways achieve compliance rates 20–30% higher than AIC pathways, suggesting that the inclusion of deontic operators significantly enhances normative pressure without triggering the resistance often associated with rigid command-and-control approaches.

The collective land system reforms provide another illuminating example of ADIC-norms in action. By stipulating that rural collectives “should” (D) separate land ownership, qualification, and use rights (I) while respecting local economic conditions (C), this framework has enabled diverse implementation models ranging from Jiangsu's industrialized homestead transfers to Yunnan's tourism-oriented land leases [40]. This aligns with collaborative governance model, while adding an important dimension: the use of performance incentives (like promotion criteria for local officials) to prevent the “implementation drift” often observed in purely adaptive systems [41]. The theoretical innovation here lies in demonstrating how adaptive governance can be systematically structured through institutional grammar, offering a potential analytical framework applicable to other policy domains beyond land use.

(3) ADICO-Rules and Rigid Governance: The Non-Negotiables of Ecological Civilization

The concentrated use of ADICO-rules in cultivated land protection and ecological conservation pathways represents China's uncompromising approach to safeguarding its most critical sustainability thresholds. These complete regulatory formulations, featuring all five institutional grammar components including stringent deontics (“must not”) and explicit sanctions (O), create what might be termed “inviolable policy spaces”—geographical and functional domains where developmental flexibility is deliberately constrained. The theoretical importance of this finding lies in its challenge to the prevailing neoliberal critique of

command-and-control environmental governance [42], demonstrating that context-specific regulatory rigidity can be ecologically effective, albeit requiring careful balancing of social equity concerns.

The ecological protection redline system exemplifies this approach at scale, placing 25% of China's territory under strict conservation regimes where incompatible activities trigger severe penalties including criminal liability [43]. This aligns selectively with Rockström et al.'s (2015) planetary boundaries framework [44], suggesting that certain ecological thresholds require absolute protection. The cultivated land protection system further illustrates this principle, where the "1:1 replacement" rule (requiring equivalent or higher quality farmland for any conversions) has maintained China's arable land at or above the "red line" despite rapid urbanization [45].

While these measures demonstrably enhance habitat preservation, their implementation may sometimes strain local livelihoods in ecologically fragile regions where alternative development options are limited. What makes China's rigid governance distinctive is its spatial and temporal targeting. Unlike blanket regulatory approaches, ADICO-rules are strategically concentrated in ecologically sensitive areas and food security corridors, while allowing flexibility elsewhere. This calibrated rigidity reflects a sophisticated understanding of coupled human-environment systems, where absolute protection in core areas enables managed flexibility in transitional zones. The practical implications are profound: for nations struggling to reconcile conservation with development, China's model demonstrates that rigid governance need not be comprehensive to be effective. Rather, by focusing regulatory intensity on critical sustainability thresholds while permitting innovation elsewhere, policymakers can achieve both ecological protection and spatial planning objectives.

5.2. Policy Implications, Limitations, and Future Research Agenda

The Institutional Grammar Tool (IGT) analysis reveals a tripartite governance model (AIC strategies, ADIC norms, ADICO rules) that offers concrete policy applications globally. For ecologically critical zones, ADICO rules should be implemented through legally binding conservation mandates integrated with real-time geospatial monitoring systems, similar to China's Ecological Redline policy but adaptable to different governance contexts. Emerging economies could establish ecological fiscal transfer systems where central funding is conditioned on local conservation performance, while developed nations might enhance existing mechanisms like the EU's Natura 2000 network with stricter compliance requirements. Urbanizing regions should prioritize AIC strategies through market-based instruments like transferable development rights, drawing lessons from China's land reform experiments but adapted to local institutional environments. Transitional rural areas would benefit from ADIC norms that balance conservation and development through participatory zoning councils, incorporating both scientific assessments and local knowledge.

The implementation of these policies requires careful consideration of contextual factors. Institutional capacity varies significantly across nations [46], with developing countries often needing technical assistance to establish monitoring systems and governance frameworks. Equity considerations must be addressed, particularly regarding indigenous land rights and community participation. The political economy of land use reform presents another challenge, as demonstrated by resistance to top-down conservation mandates in countries like Brazil and India. These implementation challenges suggest the need for phased approaches that combine immediate binding protections for critical ecosystems with gradual introduction of flexible mechanisms in less sensitive areas.

Several limitations of the current study point to valuable future research directions. The exclusive focus on national-level policies in China overlooks subnational variations and

international comparisons that could provide additional insights into hybrid governance models. Future research should employ computational text analysis to systematically compare land-use policies across different countries and governance systems. Quantitative studies are needed to establish correlations between specific policy grammars and their environmental or developmental outcomes. The theoretical framework could be expanded through integration with behavioral economics to better understand how different stakeholders respond to various policy formulations. These research directions would significantly advance our understanding of how institutional grammar shapes land-use governance effectiveness across different political and ecological contexts.

6. Conclusions

This study systematically examines China's innovative hybrid governance model for urban–rural land use, revealing how the strategic deployment of AIC-strategies, ADIC-norms, and ADICO-rules achieves a delicate balance between stringent ecological protection and sustainable spatial planning. Through text analysis and Institutional Grammar Tool (IGT) deconstruction of 62 national policy documents (2012–2024), we demonstrate that China's regulatory framework operates as a calibrated system: flexible AIC configurations (e.g., in Land Market Allocation) foster local experimentation, adaptive ADIC norms (e.g., Territorial Spatial Planning) mediate central-local tensions, and rigid ADICO rules (e.g., Ecological Protection) safeguard non-negotiable ecological thresholds. This tripartite architecture challenges conventional governance dichotomies, offering empirical evidence that regulatory stringency and flexibility can coexist when strategically targeted. The findings align with Ostrom's institutional diversity principles while extending Crawford and Ostrom's IGT framework to sustainability governance, providing an adaptable methodology for analyzing policy design in complex socio-ecological systems.

Theoretically, this research contributes to three key debates. First, it advances hybrid governance literature by demonstrating how China's "Ecological Civilization" vision is operationalized through grammatical variations in policy instruments—a novel lens that complements existing focus on implementation outcomes. Second, it responds to Rockström's planetary boundaries theory by showing how ADICO-rules create inviolable policy spaces for critical ecosystems, while AIC/ADIC pathways accommodate developmental needs elsewhere. Third, it refines experimentalist governance theories by revealing how China's "flexibility with oversight" model mitigates the accountability risks. These insights enrich comparative land-use governance studies, particularly for Global South contexts facing similar urbanization–environment tensions.

Practically, China's experience offers scalable policy innovations. The "Three Control Lines" mechanism exemplifies adaptive rigidity, binding quantitative targets while permitting localized boundary adjustments—a model applicable to other megacities managing growth boundaries. Similarly, the "increase–decrease linkage" policy demonstrates how market mechanisms can reconcile ecological and developmental goals when embedded in AIC-structured frameworks. For policymakers, our IGT-based typology provides a diagnostic tool to assess regulatory intensity gaps: for instance, the high compliance rates of ADICO-dominated ecological policies versus AIC-driven market pathways suggest where complementary oversight may be needed. These lessons are particularly relevant for developing economies navigating rapid urbanization without sacrificing environmental safeguards.

Author Contributions: Conceptualization, Y.C.; methodology, Y.C. and C.Z.; software, Y.C. and C.Z.; validation, Y.C., C.Z. and C.R.-B.; formal analysis, Y.C., C.Z. and C.R.-B.; investigation, Y.C., C.Z. and C.R.-B.; resources, Y.C. and C.Z.; data curation, Y.C. and C.Z.; writing—original draft preparation, Y.C. and C.Z.; writing—review and editing, Y.C., C.Z. and C.R.-B.; visualization, Y.C., C.Z. and C.R.-B.;

supervision, C.Z.; project administration, Y.C. and C.Z.; funding acquisition, C.Z. All authors have read and agreed to the published version of the manuscript.

Funding: This research was supported by the Jiangsu Universities Philosophy and Social Science Research Projects of China (2025SJYB1404), and the National Social Science Foundation of China (21&ZD174).

Data Availability Statement: The original data presented in the study are openly available in the Chinese Central Government Policy Database at <https://www.gov.cn/search/zhengce/> (accessed on 9 May 2025).

Acknowledgments: The authors would like to thank the anonymous reviewers and the academic editor for their support in improving this manuscript.

Conflicts of Interest: The authors declare no conflicts of interest.

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