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Bridging the legal divide: evaluating stakeholder awareness, regulatory effectiveness, and governance gaps in sustainable development across urban and rural China

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With rapid urbanization and continuing rural disparities, sustainable development has become a priority for China. As China moves towards sustainable development, the use of laws and regulations will be vital to balance and integrate environmental, social, and economic objectives at different scales across a range of sectors and regions. The focus of this study is to evaluate the understanding, implementation, and perceived effectiveness of sustainability-related laws by the main players in urban and rural China and to highlight legal governance gaps and how to amend these to make the law more effective and enhance equity in development. The study used a largely quantitative approach using stratified random sampling from urban and rural regions in China, as well as governance diversity across the regions and stakeholders involved in community, business, and government organizations. Data collection occurred from structured questionnaires, and the collected data were analyzed using descriptive statistics and regression, ANOVA, and factor analysis to explore patterns, relationships, and differences between groups, and ethical standards were upheld through the research process. The results of the studies show a great public awareness of legislation connected to development, but they also emphasize ongoing worries about disparity between urban and rural areas. Perceived legal effectiveness depended mostly on legal awareness, while regulatory enforcement was discovered to be essential in producing favorable environmental results. Discrepancies in local enforcement, especially in rural areas, nevertheless reduced the possible effect of laws. These results highlight the urgency for policies that reinforce legal education and develop enforcement capability in underprivileged areas. To guarantee fair execution and increase the general efficacy of sustainability-related legal systems, personalized, context-sensitive governance approaches are vital.

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Introduction

Sustainable development has emerged as a global imperative for the 21st century, to harmonize economic growth, social equity, and environmental sustainability (Hariram et al., 2023; Prabhakar, 2025). For a country like China, which has witnessed some of the fastest industrial transformations in human history, ensuring sustainable development of the urban and rural heartlands across the nation has thus become a major policy concern (Islam, 2024). As the second-largest economy and the most populous country in the world, China holds a strong voice in the global sustainability platform (Moore, 2022). Urbanization in China has been very fast over the last four decades. At the same time, big parts of the rural areas are facing developmental bottlenecks that include resource depletion, income disparity, environmental degradation, and weak institutional governance (Feng et al., 2023). Given the aforesaid background, laws and regulations have, therefore, become an essential means to direct and regulate developmental trends in the country and have become levers of state control and local empowerment.

In an attempt to address climatic and developmental pressures, China has outfitted itself with a panoply of laws concerning land use, environmental protection, rural revitalization, and urban sustainability. The Air Pollution Prevention and Control Law (2018 Amendment) has also strengthened the monitoring and reduction of industrial emissions (Khanam et al., 2023). On the other hand, the Rural Revitalization Strategy, through legal habilitation by means of regulations on land reform and fiscal redistribution, aims at agricultural modernization, service equity, and local economic stimulation (Deng, 2023). The Urban and Rural Planning Law (2008) and the revised Energy Conservation Law (2016) provide the regulatory framework for spatial development, resource efficiency, and infrastructure investments at the urban level (Zhao et al., 2022). Likewise, the establishment of Carbon Neutrality Goals (2060) and policies laid down in the framework of Ecological Civilization further attest to the state's commitment to a sustainable transition based on the rule of law (Bruckermann, 2025).

Moreover, China's sustainable development aims are more and more being challenged with environmental crises and social violence. As China embraces a new "quality development" path, scholars and policymakers increasingly emphasize the importance of legal and regulatory reform—not just for maintaining formal compliance, but towards transformative adaptive, inclusive, and resilient sustainability strategies (Tang, 2024). This contradiction gives rise to the main research question of this work: although China has created a complete framework of laws about sustainable development, the varied efficacy of these laws in rural versus urban areas is under-investigated. Usually concentrating on economic indicators, technological innovations, or environmental metrics, current research on sustainable development rarely examines the legal systems supporting these developments or evaluates their varied effects across spatial and organizational settings. Moreover, few empirical studies use a cross-regional, stakeholder-centric method comparing legal effects in both rural and metropolitan areas. The humanities and social sciences, where multidisciplinary research fusing law, government, development, and citizen points of view is essential for practical insights, provide especially clear evidence of this gap.

Given these difficulties, this research is both urgent and important. Knowing the part legal awareness, regulatory enforcement, and expected efficacy play is essential not only for bridging the urban-rural development gap but also for improving the legitimacy, responsiveness, and equity of sustainability governance in China. By examining how various stakeholder groups—including local officials, community leaders, legal practitioners, urban planners, and rural residents—experience, interpret, and

are affected by sustainable development legislation, this research adds to current discussions in legal sociology, development studies, and governance theory. Using mainly a survey-based method, this study goes beyond normative beliefs and records real-world attitudes and institutional realities across several geographic and socioeconomic contexts.

Furthermore, this study supports China's national policy goals as well as worldwide sustainability pledges. Particularly, SDG 11 (Sustainable Cities and Communities), SDG 16 (Peace, Justice and Strong Institutions), and SDG 13 (Climate Action), it help the aims of the United Nations Sustainable Development Goals (SDGs). Furthermore, it mirrors China's own targets set out in the 14th Five-Year Plan (2021–2025), which aims for "rule-of-law-based governance" and better environmental, social, and economic results by means of legal instruments. Beyond China, this research is pertinent as it provides comparative insights for other developing nations fighting similar legal and institutional asymmetries in their quest for sustainability. Emphasizing the part legal awareness, governance, and regulatory enforcement play in advancing sustainable development throughout rural and urban China, this study fits very well with the United Nations Sustainable Development Goals (SDGs), especially SDG 16 (Peace, Justice and Strong Institutions), SDG 13 (Climate Action), and SDG 10 (Reduced Inequalities). Based on recent empirical studies like Wang et al. (2024, 2025), which showed that environmental damage, especially when institutional quality (IQ) and governance are poor, impairs equitable development results by disparities in legal implementation. While globalization and governance can lessen the negative consequences of CO emissions on health and well-being, institutional deficiencies confine their full effectiveness, Wang et al. discovered. This study helps worldwide discussions on reaching SDGs through better legal systems and inclusive governance structures by highlighting how urban-rural inequalities and gaps in enforcement affect sustainability-related policies in China.

The focus of the study is threefold.

First, the study looks at the level of legal knowledge and the perceived level of regulatory functionality among key stakeholders in selected urban and rural contexts in China. This includes determining how aware stakeholders are of sustainability laws, and whether they consider these laws functional, fair, and impactful. Second, we examine how the enforcement of these laws affects environmental, economic, and social sustainability outcomes in urban and rural contexts and whether the laws are having the effects intended, and whether the gradual increase in enforcement intensity corresponds to sustainability development achievements; and third, we want to determine obstacles, gaps and recommendations for improvement of the legal governance of sustainable development, based on empirical case methodology. Based on the findings, the study aims to contribute not only to academic debates but, policy reform and governance innovation in China's search for balanced and inclusive development.

Literature review

The complex interactions of laws, regulations, and sustainable development in Chinese urban and rural areas have received considerable academic attention in recent years. Many studies have attempted to understand how policy environments and governance frameworks affect development; many have found spatial variation and sectoral inefficiencies. Zhang et al. (2024) developed a comprehensive policy evaluation framework that connected the Multiple Streams Theory, utilized text mining techniques, and developed the Policy Modeling Consistency Index (PMC-Index) model to assess the effectiveness of

characteristic towns' policies in China. They applied this framework to 225 policy documents released between 2015 and 2022 and adapted the PMC-Index by linking PMC-Index indicators with an understanding of multiple streams. Using ten policies in their review, Zhang et al. found a mean PMC index score of 7.13 points out of 9 points. Most of the policy evaluations indicated satisfactory performance. However, the study identified substantial deficiencies in policy effectiveness, content structure, and guarantee mechanisms. Zhang et al. made recommendations to clarify administrative borders, ensure urban–rural resource integration, and promote a bottom-up governance hierarchy in policy.

In a similar vein, Shi and Yang (2022) dealt with the limitations of the single-method assessments of rural sustainability. They developed a rural revitalization index with multiple dimensions based on the above five aspects—industrial prosperity, ecological livability, rural civilization, efficient governance, and a good life—designed to assess rural development through kernel densities and least squares methods for a group of 31 provincial regions from 2000 to 2020. Based on Shi and Yang's (2022) findings, rural sustainability had generally improved over time, but differences among regional areas remained. The authors developed seven types of rural development trajectories using spatial-temporal clustering, emphasizing the need for plans for policy design to be differentiated and regionally specific. Yanbo et al. (2021) developed a theoretical framework to examine a concept called rural settlement transition (RST) by investigating the coupling of land use change and population movement from 1996–2016 in Shandong Province. For the purposes of the meaning exchange, they utilized the per capita rural settlement area (PCRA) and found that the rural population significantly declined, followed by stabilization, while the rural settlement areas fluctuated to increase at first before experiencing a rapid decline. They concluded that the route of the spatial evolution of RST was from urban centers to suburban areas and ultimately to exurban areas, encompassing a major transition in development trajectory from extensive use to intensive. This relationship and the degree of coordinated evolution of changing population bases and land uses were considered important to achieve sustainable rural development within urbanization.

In a related case study by Guo and Liu (2021), the authors studied the assetization of land as an approach to poverty alleviation and rural development. Guo and Liu (2021) explored, through a case study, land as not simply a resource, but as an asset, as a means to empower rural communities. The findings revealed that the reforms in land tenure enabled the revitalization of rural production relations, activating land as a source of capital and allowing the evolution of land use. These processes facilitated poverty reduction and rural revitalization within the framework of national development goals. Yao and Jiang (2021) examined the dual influences of economic and institutional urbanization on rural-urban income inequality by employing a dynamic panel data model. Their findings indicate that increasing rural productivity reduced income inequality, while increasing urban productivity increased income inequality. The hukou (household registration) openness policy displayed a negative and delayed effect on income inequality, further showing that institutional structures impact equitable development. The Kuznets curve thesis posits that per capita GDP and the number of urban dwellers showed a negative association with rural-urban income inequality, lending support to the Kuznets curve characterization of development in the context of China.

Jiang et al. (2022) quantitatively examined the urban–rural gap (URG) from the years 2000 to 2018 using provincial panel data using the restricted effects model and kernel density estimation. Their study evaluated the relative contributions of population

urbanization (PUR), industrial urbanization (IUR), and land urbanization (LUR) to social economic system (SEC) gaps and residents' living standards (RLS) gaps. It was established that the urbanization of the population PUR closed both SEC and RLS gaps, while IUR increased the SEC and RLS gap, especially in the economically advanced eastern provinces. LUR also increased the SEC and RLS socioeconomic disparities in the coastal region. The authors concluded with a clear indication of the uneven influence of differential urbanization strategies, stressing the importance of integrated planning, which balances development and equity objectives. Liu et al. (2021) investigated the importance of environmental risk perception and public participation in fundamentally shaping the nature and content of public evaluations about local government environmental regulatory action. Using structured equation modeling (SEM) and data from the 2015 Chinese General Social Survey (CGSS), the authors found that public perception of environmental risk negatively affected trust in regulatory implementation, while public participation exhibited a positive effect. Satisfaction with environmental governance served as a mediator of the relationship between risk perception and evaluations of regulatory practice. There were significant moderating factors such as institutional trust and public environmental knowledge, which provided a deeper understanding of how enhanced governance quality could stem from issues of transparency, civic engagement, and education. Huang et al. (2024) examined the spatial dynamics of environmental regulation and green development with a spatial Durbin model of environmental regulation and green development. Their work suggests that investment-based environmental regulation has a strong positive spatial spillover, especially when considering the spatial linkage among neighboring regions. Their conclusions for cost-based environmental regulations are more mixed: they are beneficial in isolation, but generate negative externalities (i.e., pollution relocation) when spatial effects are considered. Interestingly, R&D subsidies appeared ineffective in isolation but had substantial positive regional impacts when taking spatial interactions into account, likely because of technology diffusion and knowledge transfer. The study revealed that environmental policy impacts were context-specific and variable depending on the type of regulation, regional contexts, and spatial interactions. Xu et al. (2025) contributed both qualitative case analyses and analytic hierarchy process (AHP) in a mixed-methods approach to help identify systemic risks that threaten urban sustainability. This research also identified policy awareness gaps, uneven compensation mechanisms, and maladaptive governance practices that undermine infrastructure initiatives, while proposing adaptive governance strategies to balance technical effectiveness with social equity, including transparent policy development practices, stakeholder engagement, and cross-sector collaboration, to minimize future systemic risks and foster long-term ecological and social resilience within communities.

Utilizing Wanshi Village as a case study, Yu and Ye (2025) created a conceptual framework for cross-boundary governance grounded in space, stakeholders, scale, and function. Their results revealed that environmental governance in such areas depended rather much on government action, with little influence from non-governmental players, and that current governance structures were insufficient to solve regional conflicts. Through a quasi-natural experiment, Zou et al. (2025) investigated the effects of digital governance on green development, finding that although effects were more obvious in big and affluent cities, digital tools improved green results by rationalizing industrial structures. Zhao and Zhao (2025) discovered that ecological legal institutions, such as environmental protection courts, dramatically advanced green innovation in businesses, especially when supported by governmental pressure and high public

environmental concern. Similarly, Dai (2025) reviewed the Carbon Emissions Trade Pilot Policy and validated its effectiveness in cutting corporate carbon emissions, especially among state-owned businesses and enterprises in the eastern area, with government and public awareness acting as important moderators. Cheng et al. (2025) underlined a trade-off between ESG performance and labor share, adding that companies under more intense environmental governance pressure saw more noticeable adverse effects on labor outcomes. Sun et al. (2025) showed that government environmental audits greatly boosted corporate green investment, especially in companies with environmentally aware executives or that received state subsidies. Together, these studies showed that while sustainability regulations and policies helped to produce environmental gains, they also revealed regulatory inconsistencies, equity issues, and uneven implementation across areas and sectors.

Though many studies investigate urban-rural disparities in China, sustainability, and environmental governance (Zhang et al., 2024; Shi & Yang, 2022; Jiang et al., 2022; Xu et al., 2025), a significant vacuum in knowledge exists on how stakeholder-level legal awareness and perceptions of regulatory function impact sustainability results. Although little has specifically examined how legal knowledge and perceived law effectiveness among communities, corporations, and local governments shape the practical application of sustainability policies, previous research has concentrated on policy text evaluation (Zhang et al., 2024), rural development indexes (Shi & Yang, 2022), and urban-rural socio-economic divergence (Jiang et al., 2022). Although studies like Liu et al. (2021) and Xu et al. (2025) emphasize the role public trust and involvement play, they do not completely explore the relationship between enforcement level and the real achievement of environmental, economic, and social sustainability. By evaluating stakeholder awareness and enforcement effects throughout China's urban and rural settings, this research solves these gaps. By connecting legal knowledge, regulatory opinion, and sustainability results, this study provides empirical data on how stakeholder understanding and enforcement variations affect development in rural and metropolitan China, thereby making a major academic contribution. By placing legal awareness and participatory enforcement as essential intermediaries of sustainable development, it fosters a legal governance dialogue. From a policy standpoint, the research guides the development of context-sensitive legal systems, supports more civic legal education, location-specific enforcement processes, and inclusive governance models. These ideas offer practical advice for legislators trying to match legal systems with China's goals of sustainability and equity.

Theoretical framework and hypothesis development. The sustainable development of Chinese cities and rural areas is a complex event shaped not only by economic and environmental elements but also by institutional and legal frameworks controlling growth. The trajectory of sustainable development is shaped mostly by laws and rules, according to this research. Two connected theoretical frameworks are used to conceptually support this investigation: Legal Institutionalism (Deakin et al., 2017) and Sustainable Development Theory (Dasgupta, 2007). Particularly in a setting when urban-rural differences persist, these viewpoints allow one to comprehend how legal knowledge, legislative enforcement, and views of institutional efficiency impact economic, social, and environmental sustainability outcomes.

Legal Institutionalism sees the law as an ever-changing institution integrated into larger socio-political and economic structures, not only as a collection of rules (Croce, 2011). Legal systems organize human interaction by lowering uncertainty,

creating official limitations, and allowing for predictable outcomes. Laws are deeply connected with bureaucratic procedures, policy execution tools, and public accountability systems in the framework of China's hybrid administrative and market-based system (Ho, 2013). Under Legal Institutionalism, rules and legislation serve both as enabling instruments for sustainable projects (e.g., land-use zoning, environmental protection legislation) and as constraints guaranteeing compliance, equity, and long-term societal welfare (Circo, 2007). Although it is mostly top-down in China, the governance model increasingly includes local autonomy and decentralized control. This results in a legal environment in which rural and metropolitan areas have vastly different enforcement capabilities, awareness, and stakeholder involvement. Legal institutionalism also acknowledges the adaptive character of law: legal systems grow in response to economic stresses, environmental calamities, and public expectations (Viola, 2022). Therefore, the interpretation of laws—whether as enablers of progress or as obstacles—depends not only on their content but also on how well institutions execute, oversee, and apply them. This brings about the first theory:

H1: Perception of legal effectiveness in advancing sustainable development is favorably correlated with greater levels of legal awareness among stakeholders.

A necessary antecedent for institutional legitimacy is legal consciousness (Buchanan, 2018). Even well-designed legislation may not produce desired sustainability results if residents and stakeholders lack knowledge of current rules or see them as irrelevant or unreachable. According to Legal Institutionalism, voluntary compliance and long-term social coordination depend on public legitimacy of legislation (Jackson et al., 2023). Moreover, the effectiveness of legal institutions is reflected in enforcement mechanisms. Often reported in rural and impoverished areas, inconsistent or selective enforcement damages legal interventions' efficacy as well as institutional trust. On the other hand, strong enforcement institutionalizes sustainable behaviors, discourages malpractice, and advances environmental responsibility. This results in the second theory:

H2: Stronger regulatory enforcement in urban as well as rural settings is positively related to better environmental sustainability results.

Legal institutionalism also stresses the mediating function of perceived performance and institutional trust (Black, 1997). The perceived legal effectiveness is suggested as a mediating factor in this study that directs legal knowledge into real developmental results. People who know the law may only act on it if they think it operates justly and effectively. Hence:

H3: The connection between legal knowledge and sustainable development results is mediated by perceived legal effectiveness.

Providing the normative and operational basis for the study, Sustainable Development Theory adds to the institutionalist perspective. According to the Brundtland Report, sustainable development is the search for expansion that satisfies current demands without sacrificing future generations' capacity to meet theirs (Hajian & Kashani, 2021). Emphasizing "ecological civilization," rural revitalization, and green urbanization—all of which depend on strong legal systems to thrive—China's own development agenda emphasizes these values. Sustainable Development Theory holds that to reconcile conflicting development objectives, one must have systematic and integrative policies—often formalized in laws (Dernbach, 2003). Urban zoning laws, for instance, are vital for limiting overconstruction; rural land changes influence food security and economic sustainability

(Wang et al., 2019). One of the criticisms of the theory, though, is that the advantages of development are sometimes unequally divided, especially between rural and urban areas. While rural areas often fall short in terms of legal access, enforcement capacity, and institutional investment, urban areas in China have greater resources, administrative capacity, and public services (Qian, 2017). This regional imbalance lends support for the following hypothesis:

H4: Laws and rules benefit urban areas more for economic growth than rural ones.

The third pillar of sustainable development, social sustainability, centers on participatory governance, inclusion, and fairness (Gorbachev, 2005). In this study, stakeholder participation—whether through legal consultation, feedback mechanisms, or civic engagement—is viewed as a vital condition for socially sustainable outcomes. Participation enhances the legitimacy of law, facilitates context-sensitive regulation, and enables local ownership of sustainability initiatives. Therefore:

H5: Perceptions of social equity in sustainable development projects are favorably correlated with greater degrees of stakeholder participation.

Sustainable Development Theory stresses participatory planning as a means to reconcile conflicting interests, guarantee representational justice, and fit solutions to local circumstances (Leuenberger & Wakin, 2007). Promoting such engagement, legal systems will help to create among people a feeling of justice and inclusivity. Urban-rural variance acts as a contextual mediator impacting institutional tool efficacy. Differences in education, infrastructure, financial capacity, and governance quality all affect how laws are received and enforced. The study suggests as follows:

H6: Urban-rural divide weakens the link between environmental consequences and regulatory enforcement, therefore the effect is more pronounced in urban areas.

The two ideas are connected by this moderating theory: while Sustainable Development Theory emphasizes why these environments are crucial for fair results, Legal Institutionalism clarifies how regulatory enforcement depends on institutional environments. The theory predicts that, even under the same laws, results will vary according to location and manner of execution. Integrating Legal Institutionalism and Sustainable Development Theory, this study builds a consistent framework for legal systems to influence sustainability results in both urban and rural China. The basis of hypothesis 14 is legal institutionalism, stressing that while institutional differences produce unequal economic benefits (H4), legal

awareness (H1), enforcement intensity (H2), and perceived legal efficacy (H3) motivate sustainable behaviors. It emphasizes law as a dynamic institution whose success depends on public legitimacy and enforcement capability. By framing Hypotheses 5 and 6—emphasizing that stakeholder engagement (H5) advances social fairness and regional differences (H6) compromises the enforcement-outcome connection—sustainable development theory adds a complement to this. Participative governance and place-specific contexts shape sustainability results; together, these theories explain not only how legal processes function but also why. The model (Fig. 1) therefore shows a layered logic whereby legislation is are tool of coordination, sustainability is the objective, and institutional trust, awareness, and inclusion are the avenues of bridging development gaps.

Research methodology

Designed to thoroughly evaluate legal awareness, perceptions of regulatory effectiveness, enforcement discrepancies, and sustainability results across chosen urban and rural areas of China, the research approach used in this study is mostly quantitative. To guarantee representativeness of important stakeholder groups—including government officials, local business leaders, environmental NGOs, and neighborhood representatives—the study employed a stratified random sampling technique. Geographical location (urban vs. rural) and stakeholder group defined the stratification, enabling sophisticated legal awareness and regulatory perceptions across different environments to be compared. Stratified random sampling was used to guarantee balanced representation over important stratageographic regions (urban versus rural) and stakeholder categories (government officials, business leaders, NGOs, and local community representatives) to handle the complexity and diversity of stakeholder views across urban and rural China. By recording institutional and socio-economic differences impacting legal awareness and sustainability outcomes, this method improved the generalizability of findings. G*Power software was used to calculate the smallest sample size needed for structural equation modeling (SEM), which led to a target of at least 400 replies to fulfill standard SEM thresholds (minimum N 1020 times the number of indicators per latent construct).

The aim of the research was to collect varied experiences and attitudes in both metropolitan and rural environments, where socioeconomic and institutional conditions differ considerably, which justified this sampling technique. It was found that a sufficiently large sample size would facilitate strong statistical analysis and improve the generalizability of the results to wider Chinese rural and urban groups. Administered structured questionnaires consisting of closed-ended questions intended to measure levels of legal knowledge, perceived fairness,

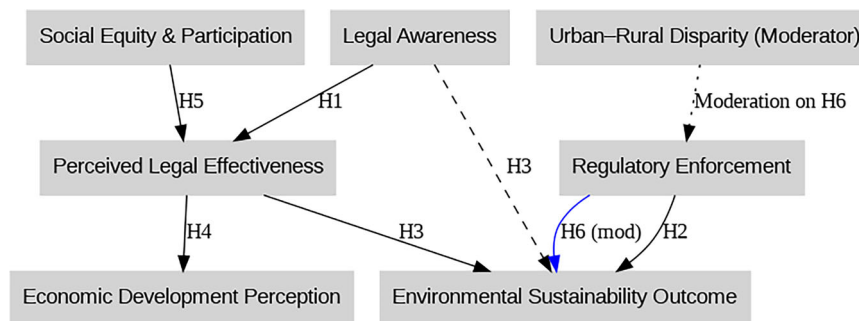


Fig. 1 Conceptual model linking legislation, coordination, and sustainable development. This figure represents the various layers of the proposed model, where legislation is seen as the main coordination tool, sustainability is considered the main goal, and institutional trust, legal awareness, and social inclusion are the development gap closing mechanisms. The arrows indicate the relationships between the constructs, while the layers display the hierarchical arrangement of the model.

enforcement severity, and the effects of laws on environmental, economic, and social sustainability were part of the data gathering procedure. Based on a thorough literature study and current confirmed scales pertaining to regulatory effectiveness, public perception, and sustainable development indicators, the questionnaire questions were created. Established and peer-reviewed instruments adapted for the Chinese environment were used to operationalize survey constructions. Legal Awareness contained items regarding awareness of sustainability legislation and rights (e.g., I am aware of the environmental rules relevant to my area), while Regulatory Effectiveness assessed perceptions of fairness, access, and institutional responsiveness. Enforcement Intensity included measures on perceived strictness, frequency, and transparency of law enforcement; Sustainability Outcomes were divided into environmental (e.g., pollution reduction), economic (e.g., income change), and social (e.g., equity and inclusion) indicators. Answers were recorded on 5-point Likert scales (1 = Strongly Disagree to 5 = Strongly Agree). The survey instrument was first tested with a tiny sample of respondents from both rural and urban locations, then modified to reduce response bias and increase reliability. Face-to-face interviews and online surveys were used to gather data in order to maximize reach and access, especially in distant rural locations where internet coverage could be low. Descriptive and inferential statistical methods were used to thoroughly analyze the gathered data. Descriptive statistics provided a clear picture of stakeholder features and first trends by summarizing the demographic profiles, levels of legal knowledge, and views of regulatory performance. Bivariate correlation and multiple regression analyses were run to evaluate interactions between variables, including enforcement intensity and sustainability results, to offer an understanding of the intensity and importance of these relationships. Furthermore, comparative studies including ANOVA and independent samples t-tests were utilized to find statistically significant variations among rural and urban stakeholder groups regarding their legal awareness and impressions of regulatory effectiveness. Cronbach's alpha coefficients were used to assess the dependability of measurement scales, hence guaranteeing internal consistency of the survey concepts. Factor analysis was also done to confirm the underlying dimensions of regulatory perception and sustainability effect constructs, therefore increasing the construct validity of the research. Variance inflation factors (VIF) were evaluated in an effort to solve any multicollinearity among independent variables. Finally, by obtaining informed consent from every participant, guaranteeing confidentiality, and obtaining appropriate institutional permissions before data gathering, the study followed ethical research norms. This all-inclusive quantitative approach helped the study to generate empirically based, statistically strong results that support understanding the intricate relationships between legal control and sustainable development in China's urban and rural areas. Coding followed standard methods: Likert items were addressed as continuous variables; negatively worded items were reverse-coded. Cronbach's alpha (all constructs > 0.70) and Composite Reliability (CR > 0.82) were used to examine reliability. Exploratory and Confirmatory Factor Analysis (CFA) verified validity; Average Variance Extracted (AVE > 0.50) and factor loadings ranging from 0.69 to 0.86 were used. Variance Inflation Factors (VIF < 2) tested for multicollinearity. SEM was chosen for its ability to test complex, multi-path correlations between latent constructs and to assess both direct and mediating effects hypothesized in the model.

Results

Drawing on responses from a stratified sample of 450 participants, the research combines descriptive and inferential statistical

Table 1 Demographic Characteristics and Significance Tests.

Variable	Category	Percentage (%)	Significance ($\chi^2/t/F$)	p-value
Gender	Male	60.0%	t = 1.45	0.148
	Female	40.0%		
Region	Urban	50.0%	$\chi^2 = 8.36^a$	0.004
	Rural	50.0%		
Age Group	18-30	24.4%	F = 2.76 ^b	0.042
	31-45	44.4%		
	46+	31.2%		
Occupation	Government Official	22.2%	F = 3.84 ^b	0.03
	Legal Practitioner	20.0%		
	Urban Planner	17.8%		
	Community Leader	20.0%		
	NGO/Activist	20.0%		

^aSignificant at $p < 0.01$.

^bSignificant at $p < 0.05$.

methods to decode perceptions, relationships, and causal pathways among several constructs including legal awareness, regulatory enforcement, perceived legal efficacy, environmental consequences, social equity, economic development, urban-rural difference, and civic participation. With a slightly higher proportion of males (60%) than females (40%), respondents' demographic profile shows a somewhat varied population (Table 1); however, the t-test results ($t = 1.45, p = 0.148$) show that this gender gap did not produce statistical relevance regarding effect on the dependent constructs. Although the Chi-square test ($\chi^2 = 8.36, p = 0.004$) showed a statistically significant difference in answers depending on area, indicating different regional experiences with law enforcement and policy effectiveness, regional representation was equally divided with 50% each from urban and rural zones. With the majority (44.4%) between 31 and 45 years, age distribution among the sample gravitated toward mid-career adults; the rest split between younger (18-30, 24.4%) and older (46+, 31.2%) demographic groups, with an ANOVA ($F = 2.76, p = 0.042$) validating age-based perceptual disparities. Ensuring that ideas were driven by diverse stakeholder viewpoints inside the legal and developmental ecosystem, the sample also included a rich vocational mix of government officials, legal practitioners, NGO representatives, community leaders, and urban planners.

The descriptive statistics (Table 2) for main ideas showed essentially moderate to high mean values, pointing to agreement with positive statements regarding legal systems and their felt influence. Legal awareness in this research is stakeholders' awareness of regulations and their relevance for sustainability, thereby reflecting their ability to identify, analyze, and react to legal rules. Particularly comparing urban and rural regions, regulatory enforcement measures the degree of uniformity and intensity with which rules are applied over settings. Perceived Legal Effectiveness gathers stakeholder perceptions of how well legislation fulfills their intended environmental and development aims. Environmental Sustainability gauges the degree of legal systems supporting ecological protection. Economic Development assesses legal backing for inclusive economic growth. Social Equity and Participation examines fairness and citizen involvement. Urban-Rural Disparity indicates observed inequalities in legal implementation and outcomes across geographic regions (Fig. 2). Legal Awareness, for instance, showed the highest mean

Table 2 Descriptive Statistics, Reliability, and Validity of Constructs.

Variable	Mean	SD	Cronbach's α	Composite Reliability (CR)	AVE
Legal Awareness	3.88	0.71	0.84	0.87	0.63
Regulatory Enforcement	3.54	0.75	0.82	0.85	0.59
Perceived Legal Effectiveness	3.67	0.78	0.85	0.88	0.66
Environmental Sustainability	3.72	0.68	0.81	0.84	0.61
Economic Development	3.59	0.82	0.83	0.86	0.62
Social Equity and Participation	3.65	0.74	0.86	0.88	0.65
Urban-Rural Disparity	3.41	0.90	0.79	0.82	0.58

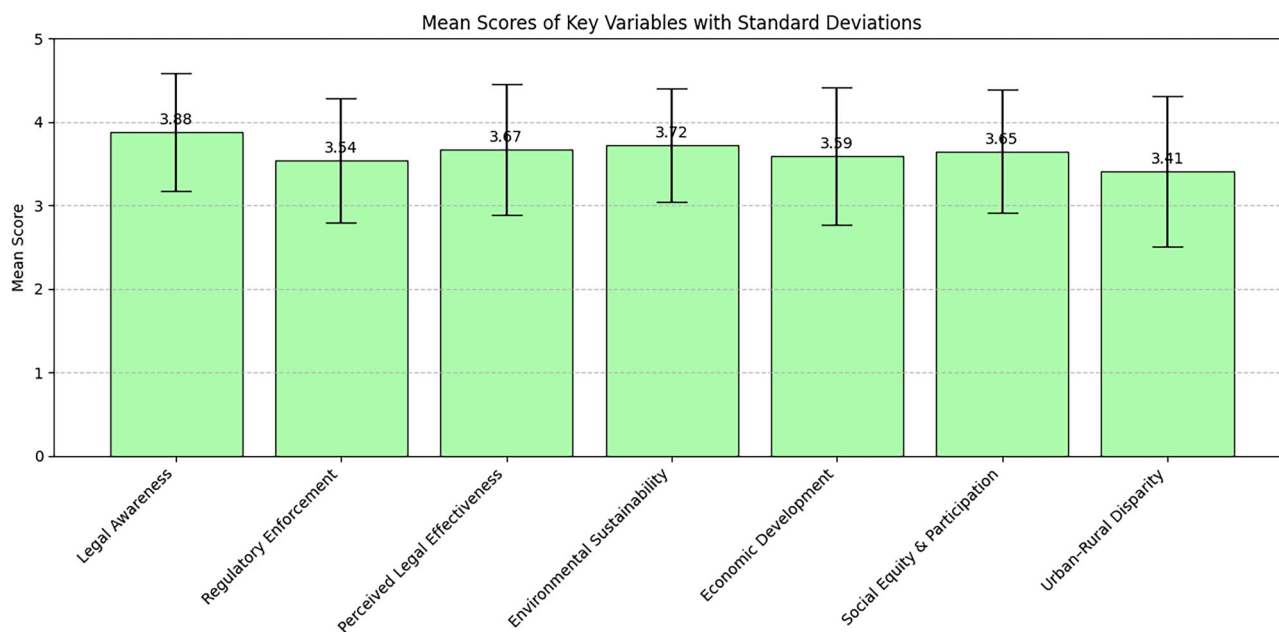


Fig. 2 Urban-rural disparity in legal implementation and development outcomes. This figure reveals the difference between urban and rural areas concerning the application of legal measures and their corresponding sustainability outcomes. The panels present indicators for comparison, where symbols indicate the amount of difference across the geographic categories and also point out the areas where the implementation gaps are the most apparent.

($M = 3.88$, $SD = 0.76$), reflecting strong public awareness about laws relevant to development, while Urban-Rural Disparity had the lowest mean ($M = 3.41$, $SD = 0.90$), highlighting significant concern over unequal development outcomes. The high standard deviation for this construct suggests substantial variation in responses, likely influenced by geographic and socioeconomic factors. Cronbach's alpha values, all exceeding the recommended threshold of 0.70, indicated strong internal consistency for all constructs, therefore reinforcing the reliability of measurement items. Composite reliability (CR) values were likewise robust, all above 0.82, while Average Variance Extracted (AVE) ranged from 0.58 to 0.66, indicating solid convergent validity. These results support the hypothesis that each construct was well measured and conceptually distinct. Furthermore validating the structure of the measurement model, confirmatory factor analysis (CFA) revealed strong standardized factor loadings for all items, with values ranging from 0.69 to 0.86 and statistical significance at the $p < 0.001$ level (Table 3). Notably, constructs like Perceived Legal Effectiveness and Legal Awareness showed exceptionally high factor loadings, indicating that respondents clearly knew and agreed on what these constructs represented.

Using the Fornell-Larcker criteria, which meant that the square root of AVE for each construct (diagonal values) surpassed the inter-construct correlations, the inter-construct correlation

Table 3 Confirmatory Factor Analysis (CFA) - Factor Loadings.

	Item Code	Standardized Loading
Legal awareness	LA1	0.72
	LA2	0.84
	LA3	0.77
Regulatory enforcement	RE1	0.70
	RE2	0.81
	RE3	0.75
Perceived legal effectiveness	PE1	0.86
	PE2	0.79
	PE3	0.81
Environmental sustainability	ENV1	0.79
	ENV2	0.74
	ENV3	0.77
Economic development	EC1	0.75
	EC2	0.73
	EC3	0.78
Social Equity and Participation	SOC1	0.83
	SOC2	0.76
	SOC3	0.79
Urban-Rural Disparity	DIS1	0.69
	DIS2	0.74
	DIS3	0.77

Table 4 Correlation Matrix and Discriminant Validity (Fornell-Larcker Criterion).

Constructs	1	2	3	4	5	6	7
1. Legal Awareness	0.79						
2. Regulatory Enforcement	0.42	0.77					
3. Perceived Effectiveness	0.47	0.45	0.81				
4. Environmental Outcome	0.39	0.49	0.52	0.78			
5. Economic Development	0.36	0.41	0.43	0.50	0.79		
6. Social Equity	0.40	0.44	0.47	0.42	0.45	0.81	
7. Urban-Rural Disparity	-0.31	-0.37	-0.28	-0.33	-0.39	-0.35	0.76

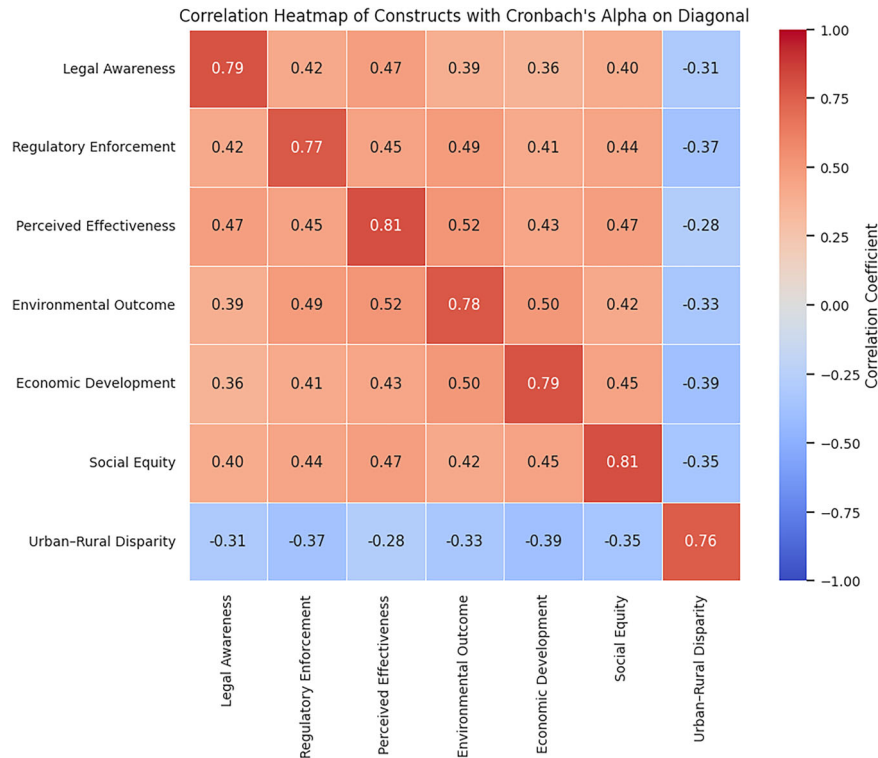


Fig. 3 Inter-construct correlations demonstrating discriminant validity. This figure depicts the correlation matrix that was used to determine discriminant validity according to the Fornell-Larcker criteria. The diagonal cells contain the square roots of the AVE values for each construct, which are greater than the inter-construct correlations. The panels emphasize the most important connections, like the very strong positive correlations between Participation and Social Equity ($r = 0.47$) and between Perceived Legal Effectiveness and Environmental Sustainability ($r = 0.52$).

Table 5 Structural Equation Modeling (SEM) - Pathway Analysis.

Path	Standardized β	S.E.	CR	p-value	Supported
Legal Awareness \rightarrow Perceived Effectiveness	0.48	0.06	8.00	<0.001**	Yes
Regulatory Enforcement \rightarrow Environmental Outcome	0.52	0.07	7.43	<0.001**	Yes
Perceived Effectiveness \rightarrow Environment	0.41	0.05	7.20	<0.001**	Yes
Region (Urban-Rural) \rightarrow Economic Outcome	-0.34	0.09	-3.78	0.004**	Yes
Participation \rightarrow Social Equity	0.57	0.08	7.13	<0.001**	Yes
Urban-Rural Disparity \times Enforcement \rightarrow Environment	-0.29	0.10	-2.91	0.013*	Yes

matrix further confirmed discriminant validity. Strong positive correlations were noted between items logically should coincide (Table 4), including Participation and Social Equity ($r = 0.47$) and Perceived Legal Effectiveness and Environmental Sustainability ($r = 0.52$) (Fig. 3). These links imply that strong legal systems not only protect the environment but also promote civic inclusion and fair access to development advantages. On the other hand, Urban-Rural Disparity displayed negative links with nearly all other concepts, notably Economic Development

($r = -0.39$) and Regulatory Enforcement ($r = -0.37$), implying that unequal development and sporadic enforcement of rules continue to hamper wider development objectives, particularly in rural areas. These adverse relationships support worries over geographical disparity and the inability of centrally mandated rules to equally provide advantages across various locations.

Testing the predicted relationships among variables, structural equation modeling (SEM) yielded findings that backed up all six suggested hypotheses empirically (Table 5). First, Legal Awareness

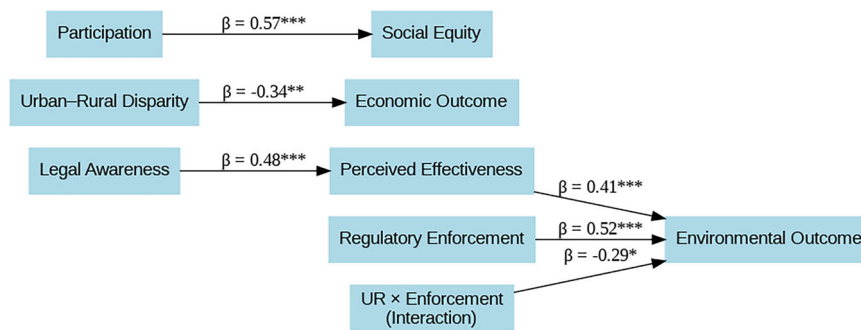


Fig. 4 Structural equation modeling results for hypothesized relationships. This figure displays the SEM path model testing the six proposed hypotheses. Standardized path coefficients and significance levels are shown for each directional relationship. The highlighted path from Legal Awareness to Perceived Legal Effectiveness ($\beta = 0.48$, $p < 0.001$) indicates a substantial positive effect, supporting the argument that individuals with stronger legal awareness perceive legal systems as more effective in promoting sustainable development.

had a considerable beneficial impact on Perceived Legal Effectiveness ($\beta = 0.48$, $p < 0.001$) (Fig. 4), supporting the idea that people with knowledge of legal systems are more likely to see them as successful in advancing sustainable development. This emphasizes how important public education, legal literacy projects, and open access to legal information are as facilitators of sustainable government. Second, Regulatory Enforcement significantly predicted Environmental Outcomes ($\beta = 0.52$, $p < 0.001$), thereby proving the critical role of the actual execution and enforcement of rules in reaching desired environmental results, including pollution reduction, resource preservation, and sustainable land use. Among the model, this path coefficient was highest, indicating that regulation success turns on implementation more so than awareness or design. Thirdly, regional-based differences arose as important predictors of development outcomes; specifically, the model discovered that living in a rural area adversely affected Economic Development outcomes ($\beta = -0.34$, $p = 0.004$), suggesting persistent structural inequalities in resource allocation, infrastructure access, and policy effect between urban and rural areas. Fourthly, Perceived Legal Effectiveness considerably influenced Environmental Sustainability ($\beta = 0.41$, $p < 0.001$), demonstrating that when laws are seen as credible and able to provide results, they stimulate behavioral and policy changes supporting environmental objectives. This regional disparity endangers national sustainability objectives since unequal development erodes group advancement and causes social segregation. Fifth, involvement turned out to be a strong driver of Social Equity ($\beta = 0.57$, $p < 0.001$), which suggests that inclusive governance methods—including neighborhood consultations, grassroots decision-making, and participative planning—can help to improve fairness, representation, and justice within the development process. Finally, to examine how variations in law enforcement across regions influence environmental results, an interaction term—Urban–Rural Disparity \times Enforcement was added. The negative and significant path coefficient ($\beta = -0.29$, $p = 0.013$) validated that such differences impede the environmental advantages of regulation, possibly as a result of inadequate regulatory staff, political neglect, or inferior infrastructure in rural regions. These results have practical consequences for legislative reform, stressing the need for context-sensitive implementation strategies that take local limitations into account.

Discussion

The results of this qualitative study, which evaluated the levels of legal awareness, regulatory perception, enforcement inconsistency, and developmental outcomes in urban and rural China, is reasonably well aligned with current works in the context of Chinese sustainability and strengthen the conversations in this

literature. One of the main contributions from our study was showing that stakeholder legal awareness strongly affects the perceptions of the fairness and effectiveness of laws. This supports the observations of Liu et al. (2021), demonstrating that trust in local environment governance is highly interconnected with public knowledge and perception of risk. In our case, engages who were familiar with sustainability-related legal provisions were more likely to agree with the effectiveness in obtaining environmental and developmental outcomes; this contributes to understanding legal literacy as a key condition of legitimacy in governance, and highlights the public need for civic legal education to stimulate compliance and participation. Liu et al. underscored this relationship in the lens of environmental risk perception and regulatory trust; our findings further this insight in the broader scope of sustainable development factors involving social equity and economic development, resulting in a more holistic interaction between legal awareness and policy outcomes. Based on Legal Institutionalism (Deakin et al., 2017; Croce, 2011; Ho, 2013) and Sustainable Development Theory (Dasgupta, 2007), this study shows how legal awareness and regulatory perception affect sustainability results across urban-rural China. Legal systems regarded as developing socio-political institutions influenced stakeholder trust, obedience, and participation. Perceived fairness and developmental legitimacy depended on variances in enforcement, participatory governance, and institutional responsiveness; Viola (2022) noted, flexible, decentralized models improve equity. Our results support Circos (2007) assertion that law makes possible sustainable development when correctly implemented and matched with public knowledge, therefore affecting policy outcomes beyond simple legal presence.

Additionally, the gap in the enforcement of regulations in urban versus rural areas emerged as one of the main issues in this study. This contrasted with Shi and Yang (2022), who found that national policy can help ensure sustainability pathways for rural residents, but varied widely, and was heavily reliant on how policies were implemented at a local level. Our findings suggest that even when laws are appropriately formulated, unequal outcomes are often the result of unequal systemic factors such as levels of administrative capacity, urban or rural infrastructure, and the focus and attention from institutions. This potential explains Jiang et al.'s (2022) analysis of city-regions and urban-rural development, where different levels of urbanization, such as industrially-driven urbanization versus population recovering urbanization, produced fundamentally different results and effectiveness on the socioeconomic indicators we reviewed. Both research studies advocate for policy designs that acknowledge distinct or radically differentiated area-specific contexts do not lead to rigid design and uniform scripts that prescriptively

dominate legal and regulatory governance. This collective finding converses on conceptual ground with our analysis of civic involvement and public participation as a contributing factor to perceived equity outcomes that align closely with Xu et al. (2025), who revealed that inclusive stakeholder involvement can create sustainability policy regimes in urban contexts. In our analysis, we correlate that communities where public engagement occurs score higher on social equity impacts with respect to complexity and legitimacy of governance, which is likely to produce effectiveness. Xu et al. point out that there is an acute need for adaptive governance systems to capture systemic policy gaps, which is very much the context of our study; our conclusions indicate that inflexible, or rigid regulatory frameworks, particularly in the rural context, do not support the evolution of new developmental challenges and instead recommend decentralized and participatory models of policy guidance.

Our study also illustrated the profound impacts of regulatory compliance intensity, which connect to the notions of environmental and economic sustainability. On these points, Huang et al. showcased the spatial implications of environmental and economic regulatory mechanisms (2024). Their investigation highlighted an important distinction between investment regulation and cost regulation, positing that regulatory approaches have disparate, contextualized spatial outcomes, which have a substantive relationship with our findings. The policy lag in enforcement capacity within rural contexts was echoed in Huang et al., which associated urban and economically developed micro-systems as the exemplars of regulatory benefits, as peripheral areas receive scant attention, and as a consequence of the externality or neglect, need adaptive programming. Aspects of intention drift and a spatial mismatch reinforce a need for addressing the ramifications of policy intention to policy outcome and more sustainable, spatially driven policy guidance practices. Finally, like Zhang et al., in their PMC-Index assessment of character town policies, indicated structural and procedural flaws in local policy making and unintended outcomes from policies, including sub-optimal administrative roles, and lack of formal implementation. These reflections are congruent with the enforcement issues we found in concentrating on the conversion of policy texts into operational administrative processes within rural places. Although our study did not employ the PMC-Index, the underlying concern of whether legal requirements are getting to the intended population(s) and being of benefit is a point of common interest.

Interestingly, we identified participatory governance as a key influence on equitable development outcomes, which complements Guo and Liu's (2021) conceptualization of land assetization. Whereas Guo and Liu focused on how defining land as an asset instilled a sense of agency for rural groups, both studies arrive at the notion that inclusive and contextually aware institutional mechanisms are required for real empowerment. Guo and Liu state that regulatory and structural change allow rural actors to engage in the development process with more agency. We showed that the effects of stakeholder participation positively impacted stakeholder perceptions of fairness and legitimacy, allowing us to arrive at similar conclusions. Therefore, both studies demonstrate a challenge to the assumption of top-down governance structures, while advocating for participatory models that account for and harness local agency. According to our work, perceived legal effectiveness, which is obviously different from being aware of the law or having laws enforced, also serves as a mediator for all of the sustainability dimensions. Similar to Yao and Jiang (2021), who showed that institutional changes such as the hukou policies have long-lasting outcomes on equity of development, our work suggests that even with institutional changes recognized by those governed, there could be a role for

legal perceptions as a mediator of whether laws are considered as facilitators of sustainability or wagged as governance symbols. These examples highlight a growing acknowledgement in the literature that development is based not simply on the presence of law but on a socially-nurtured relationship that involves perception, trust, and interactions with the institution.

The other relevant intersection with existing literature comes from Yanbo et al. (2021), who also traced the evolution of patterns of settlement in rural areas and the response to population movements and patterns of land use. Their direct analysis of patterns of spatial developments gives examples of the heavy entanglement of population changes, regulatory responses, and infrastructure development. Our findings support this notion by illustrating that regulatory enforcement fails without an understanding of the population trends and potential capacity to govern within local structures. In rural areas where depopulation or decentralization are apparent, regulatory enforcement wanes, thereby diluting the developmental effect of the law. Hence, our research adds evidence to the argument that spatial and demographic coordination is necessary for sustainable rural development. This argument is underscored by Zhang et al.'s (2024) call for the dual governance of urban and rural resources and a reconfiguration of policy hierarchies to support bottom-up participation. By illustrating how enforcement imbalances exacerbate developmental inequalities, our results inspire the need for both vertical integration of policies (from national to local) as well as horizontal coordination across regions and institutions.

Additionally, our research indicates the risks of environmental governance frameworks becoming performative, as opposed to transformative, if applied unevenly. Liu et al. (2021) argue that satisfaction with environmental regulation hinges on perceived trust in institutions and transparency. For some respondents in areas characterized by weak enforcement, laws were widely perceived as disconnected from reality. This resulted in disengagement and skepticism. This reinforces the notion that for legal governance to be impactful with respect to environmental issues, it must promote visible accountability and trust within communities—two conditions that serve as a precondition for long-term environmental and social resilience. Our findings further complement the views of Xu et al. (2025), who argue for governance frameworks that balance technical accuracy with social inclusiveness. For our respondents, participatory legal design and implementation were fundamental elements to transforming regulatory goals into lived experiences. Where there were participatory mechanisms that could take shape in town hall meetings, consultative committees, or public reviews, respondents reported a higher degree of satisfaction with their development outcomes, reinforcing the idea that inclusive institutions are not only worthwhile but necessary.

In drawing these comparisons, it is evident that our work adds to a growing consensus in the literature: sustainable development in the complex and layered spatial arrangement of China requires an integrated legal governance approach that builds on awareness, equitable implementation, institutional trust, and participatory abilities. The findings suggest that regulatory success rests on more than the creation of legislative tools; it relies on administrative resources and capabilities, trust from civil societies, and the ability to have adaptive mechanisms that address regions' unique needs. The findings also caution against a sole reliance on technocratic or centralized solutions, and highlight the importance of co-designed governance systems that are locally owned and responsive by communities. Here, law's role is no longer that of a static code; it has changed to a dynamic, negotiative tool of development capable of mediating both national policy aspirations and local practices. By placing legal awareness, distributive equity in enforcement, and participatory

governance at the core of the sustainable development agenda, our study complements and extends the empirical and theoretical contribution of recent Chinese research and also offers practical implications for policy and institutional reform.

The empirical results of this study show important insights that call for more specific and context-specific policy suggestions to help China's sustainable development aspirations. One of the most obvious consequences is the need to give civil legal education top priority, especially in impoverished and rural areas. Legal knowledge's close relationship with views of regulatory effectiveness indicates that laws are only as powerful as the public's understanding of them. Policies should thus include planned legal awareness initiatives using community centers, local media, and schools to boost stakeholder engagement and legal trust. Second, the research reveals that differences in regulatory enforcement across rural and urban areas greatly affect development results, therefore calling for a resetting of administrative assets. This could entail setting minimum enforcement capacity requirements in rural areas and the deployment of digital enforcement tools or mobile regulatory teams to make up for infrastructure constraints. Third, the evidence points to the effectiveness of participatory governance techniques, which should be codified in both local and national legislation. Policies demanding compulsory stakeholder consultation for local development planning—especially in regions under environmental or economic policy intervention—would democratize implementation and guarantee policies reflect contextual requirements. Fourth, the major interaction effect between urban-rural inequality and enforcement on sustainability results suggests that a one-size-fits-all legal strategy is insufficient. Therefore, adaptive policy tools like distinct legal clauses for highly-depopulated or low-capacity rural areas should be included in the next legislative changes. Finally, clear reporting systems and outside monitoring organizations should be integrated in environmental and development projects to foster institutional confidence so as to avoid performative government. These policy suggestions not only address directly the quantitative and qualitative results of the study but also acknowledge that legal systems must change from being symbolic rules into reactive, equity-oriented tools supporting sustainable results over China's intricate socio-spatial terrain.

Conclusion

The goal of this study was to evaluate among important stakeholders across rural and urban regions in China the degree of legal awareness and perceived regulatory effectiveness. It especially investigated how stakeholders see and evaluate the operation, fairness, and effect of sustainability-related legal systems. Furthermore investigated in the study were the effects of differences in the implementation of these rules on social, financial, and environmental sustainability results, as well as whether enforcement intensity matches with developmental progress. The research's last objective was to find major obstacles to efficient legal governance and provide solutions to enhance sustainable development results via improved institutional systems.

The study found that legal awareness greatly affects how stakeholders view law effectiveness. Respondents with more legal knowledge stated more trust in the ability of legal systems to help sustainability objectives across all three pillars: environment, social, and economic. Moreover, enforcement came out to be a major factor: inconsistent enforcement between rural and urban regions undermined the laws' developmental effect, particularly in rural areas where administrative capacity and institutional focus were low. These differences led to unequal sustainability results, hence confirming the unsuitableness of a one-size-fits-all governance system. Finally, the research pointed out participatory government as an important driver of legitimacy and sensed

fairness. Stakeholder engagement, especially when citizens were consulted in legal or policy processes, not only strengthened institutional confidence but also enhanced perceptions of fairness and policy effectiveness.

The results emphasize how crucial it is to create adaptable legal systems tailored to particular areas, taking local administrative conditions into account. To improve legal awareness and promote greater institutional legitimacy, legislators should give legal literacy programs top priority. Targeted investments in rural administrative infrastructure and legal capacity will also help to close urban-rural enforcement gaps. Embedding participatory mechanisms such as consulting councils or community-based legal monitoring can also ensure policies are responsive, equitable, and trusted. These steps are crucial for transforming legal systems into actual, sustainable development results throughout China's varied territorial landscape.

However, reliance on stakeholder perceptions, which, though insightful, may be biased or incomplete knowledge, and emphasis on selected areas restrict the research's scope in not fully capturing the heterogeneity of China's vast urban and rural terrain. Future studies should use larger geographical samples and combine qualitative insights with longitudinal quantitative data to more completely assess how rules and laws are changing sustainable development. Still, this study offers insightful empirical data and insightful suggestions for policymakers, administrators, and academics seeking to reinforce the legal bases of sustainable urban and rural development in China.

Data availability

Data is provided within the manuscript.

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Author contributions

JH: Writing – original draft (equal), Investigation (lead); YZ: Writing – original draft (equal), Investigation (supporting), Formal analysis (supporting), Writing – review & editing; All authors reviewed the manuscript.

Competing interests

The authors declare no competing interests.

Ethics Approval

This study was approved by Chang'an University Academic Committee in 09-2023(Number: CAU2023114E).The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

Informed consent

Written people assent and informed consent was obtained from participants by oral. All participants have been fully informed that their anonymity is assured, why the research is being conducted, how their data will be utilized, and that there are no risks to them of participating. Informed consent time:12-2023.

Additional information

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