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Institutional Mechanisms and Efficiency in Sustainable Land Use: A Case from Almaty and Turkestan Regions

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ABSTRACT

This study examines the institutional mechanisms affecting sustainable land use efficiency in Kazakhstan's Almaty and Turkestan regions. Drawing on expert interviews with representatives from governmental land management bodies, the research identifies critical barriers and potential opportunities in implementing effective land use strategies within the current socio-economic and environmental context. The study develops a region-specific framework to assess sustainable land use ef-ficiency, incorporating administrative capacity, the effectiveness of land governance tools, and the role of stakeholder engagement. Key findings underscore the necessity of enhancing institutional coordination, im-proving the integration and accessibility of land use data, and aligning policy instruments with regional needs and local conditions. The re-search reveals that fragmented responsibilities, limited interagency communication, and outdated data systems hinder sustainable land management efforts. In contrast, strong stakeholder collaboration and adaptable governance structures offer pathways for improvement. This study contributes to the academic and policy discourse by bridging the gap between theoretical frameworks and practical land use planning in developing contexts. It provides targeted policy recommendations aimed at fostering more coherent, adaptive, and sustainable land governance practices in Kazakhstan's agricultural regions, ultimately supporting national goals for land reform, environmental protection, and rural de-velopment.

Keywords: Sustainable land use, Institutional mechanisms, Land governance, Ka-zakhstan, Land use efficiency, Stakeholder interviews, Regional planning

INTRODUCTION

Sustainable land use efficiency (SLUE) is a critical component in achieving environmental sustainability, economic viability, and social equity, particularly in regions where agriculture is a primary economic activity. Globally, SLUE has gained prominence within the frameworks of the United Nations Sustainable Development Goals (SDGs), especially SDG 2 (Zero Hunger) and SDG 15 (Life on Land), which call for the optimization of land resources while preserving ecosystem services [1,2]. Achieving SLUE is particularly challenging in transitional and developing economies, where institutional capacity, governance structures, and technological resources often lag behind global best practices [3].

International studies have demonstrated that weak institutional coordination, inadequate land governance tools, and limited stakeholder engagement are common barriers to SLUE. For example, research in Eastern Europe and Central Asia highlights that overlapping mandates and fragmented data systems hinder integrated land use planning [4,5]. In African and South American contexts, participatory governance approaches have been shown to

improve SLUE by aligning policy instruments with local needs [6,7]. These findings suggest that institutional arrangements are a decisive factor in determining sustainable land management outcomes.

Kazakhstan, with its vast agricultural landscapes, faces unique challenges in implementing SLUE due to its diverse climatic conditions, historical land management practices, and evolving policy landscape. The Almaty and Turkestan regions, significant agricultural hubs in southern Kazakhstan, exemplify the complexities of land use management. These regions have experienced issues such as land degradation, inefficient irrigation practices, and fragmented institutional frameworks. Recent policy initiatives, including the centralization of land-control functions and the introduction of digital platforms like *JerInSpectr*, aim to enhance institutional efficiency and address these challenges [8].

Despite these efforts, gaps remain in effectively translating policy into practice. Institutional mechanisms often lack coordination, and there is a need for comprehensive frameworks that integrate various stakeholders' perspectives. Previous studies on Kazakhstan's land governance have largely addressed land reform, privatization, and cadastral development [9,10], but few have provided a region-specific analysis linking institutional efficiency to sustainable land use outcomes.

This study addresses this gap by examining the institutional mechanisms influencing SLUE in the Almaty and Turkestan regions. Through expert interviews with representatives from governmental land management bodies, the research identifies key barriers and opportunities for implementing effective land use practices. The study contributes to the academic and policy discourse by developing a regionally adapted framework for assessing and enhancing SLUE, grounded in empirical evidence and international governance theory. The findings offer targeted policy recommendations for more coherent, adaptive, and sustainable land governance in Kazakhstan's agricultural regions.

MATERIALS AND METHODS

This study adopts a qualitative methodological approach to examine the institutional mechanisms influencing the efficiency of sustainable land use (SLUE) in Kazakhstan's Almaty and Turkestan regions. The research design integrates primary data collection through semi-structured expert interviews with secondary analysis of legal frameworks, strategic policy documents, national and regional land use plans, and official land management records. Such a combination of qualitative interviews and document analysis provides a nuanced understanding of both formal governance structures and the realities of their implementation in practice [1,2].

A total of 26 semi-structured interviews were conducted between October 2024 and April 2025. Participants were selected through purposive sampling to ensure representation from regional and district-level governmental land management bodies, environmental protection agencies, agricultural cooperatives and farmer associations, and independent land governance experts and academic researchers. Eligibility criteria included a minimum of three years of professional experience in land governance, agricultural development, or environmental policy; direct involvement in decision-making or advisory processes related to land use; and willingness to provide informed consent for audio recording and transcription. Interviews were conducted in Kazakh (n = 15) and Russian (n = 11), each lasting between 45 and 75 minutes. The semi-structured interview guide was organized around three thematic clusters: institutional coordination and administrative governance, the effectiveness of legal and regulatory instruments, and stakeholder engagement and participation. All interviews were audio-recorded with consent, transcribed verbatim, and anonymized prior to analysis.

Data were analyzed using NVivo 14 (QSR International), which facilitated systematic coding and retrieval of qualitative data. Thematic analysis followed Braun and Clarke's six-phase framework [3], combining inductive coding based on emerging concepts from the transcripts with deductive coding derived from the study's analytical framework. Coding proceeded through familiarization with the data, generation of open codes, organization of codes into hierarchical categories, and mapping them onto the predefined analytical components. Cross-case comparisons were conducted to identify commonalities and differences between Almaty and Turkestan. To improve coding reliability, a second researcher independently coded 20% of the transcripts, and discrepancies were resolved through discussion until consensus was reached.

The region-specific analytical framework applied in this study was developed iteratively by integrating theoretical and practical insights from the Institutional Analysis and Development (IAD) framework [4], the FAO's Land Governance Assessment Framework (LGAF) [5], the OECD Principles on Water Governance adapted to land contexts [6], and sustainable land management indicators from the FAO and UNCCD [7]. This process yielded three core analytical components: institutional coordination and administrative governance, effectiveness of legal and regulatory instruments, and stakeholder engagement and participatory mechanisms. The framework was refined through pilot coding of five interviews before being applied to the entire dataset.

To strengthen validity and reliability, findings from the interviews were triangulated with multiple secondary sources, including national and regional land use plans (2019–2023), the Land Code of Kazakhstan and associated policy acts, reports from the Ministry of Agriculture and the Committee for Land Resources, regional land cadastre records, and statistical data from the Bureau of National Statistics on agricultural production, land use change, and rural employment. Triangulation allowed the verification of qualitative narratives against documentary and statistical evidence, a widely recognized practice for enhancing credibility in qualitative research [8]. In cases where discrepancies arose between data sources, additional follow-up was conducted with at least two independent informants or through archival confirmation.

RESULTS

This study examines sustainable land use efficiency (SLUE) in the Almaty and Turkestan regions of Kazakhstan, revealing that governance outcomes are shaped less by formal policies and more by practical institutional dynamics, administrative capacity, and stakeholder engagement. Drawing on interview data, official documentation, land use statistics, and complementary insights from Gulsim Aitkhozhayeva's research on land management and irrigation efficiency, this section contextualizes regional differences and identifies systemic challenges limiting sustainability.

The analysis of institutional mechanisms in Almaty and Turkestan regions revealed several key factors influencing the efficiency of sustainable land use. The results are presented according to the study's analytical framework: (1) institutional coordination and administrative capacity, (2) effectiveness of land governance tools, and (3) stakeholder engagement and participation.

Institutional Coordination and Administrative Capacity

Both regions displayed fragmented governance structures and limited administrative coherence. The division of responsibilities across multiple agencies with overlapping mandates has led to inefficiencies in land use planning and implementation (*Figure 1*). In Almaty region, administrative overlaps between environmental authorities and land departments caused delays in land allocation decisions. In Turkestan region, weak institutional capacity at the district level was reported, with staff shortages and limited training opportunities affecting the execution of land-related functions.

The absence of formal coordination mechanisms—such as interdepartmental working groups or shared land information platforms—was a recurring issue in both regions. In some cases, agencies operated in isolation, leading to policy contradictions and duplication of efforts. These governance gaps are summarized in *Table 1*.

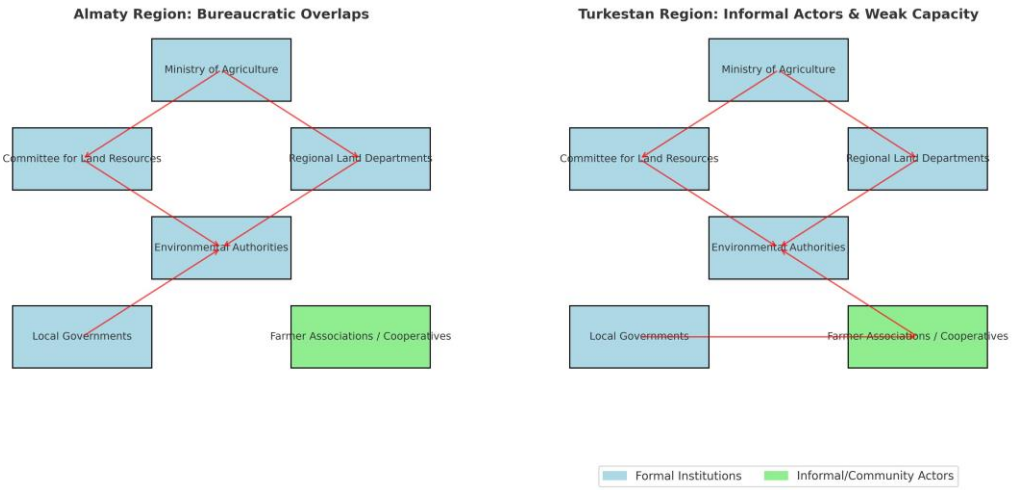

Figure 1. Institutional fragmentation in land governance structures in Almaty and Turkestan regions.

The comparative figure illustrates the fragmented institutional arrangements shaping land governance in the Almaty and Turkestan regions. In the Almaty Region, land management is primarily handled by formal institutions, including the Ministry of Agriculture, the Committee for Land Resources, regional land departments, and environmental authorities. However, overlapping mandates and weak interagency coordination create bureaucratic bottlenecks. As shown in the diagram, multiple red arrows reflect duplicative responsibilities and policy contradictions, particularly between environmental agencies and land departments. Stakeholder engagement mechanisms exist but tend to function as procedural formalities rather than substantive participatory channels.

In contrast, the Turkestan Region demonstrates a different governance dynamic. While formal institutions remain central, their effectiveness is constrained by limited administrative capacity, staff shortages, and underdeveloped digital systems. As a result, informal actors—such as farmer associations, cooperatives, and village leaders—play a more active role in land conflict resolution and coordination. These community-based mechanisms, highlighted in the figure as green entities, compensate for governance gaps by fostering local-level engagement and knowledge sharing. Yet their lack of formal authority and integration into official planning processes restricts their long-term impact.

Overall, the figure highlights two critical insights. First, institutional fragmentation undermines effective land governance in both regions, albeit through different pathways: bureaucratic overlaps in Almaty and weak administrative capacity in Turkestan. Second, the contrasting roles of formal and informal actors underscore the need for integrated governance frameworks that combine interagency coordination with inclusive, participatory mechanisms. This analysis reinforces the argument that sustainable land use efficiency in Kazakhstan requires not only improved administrative tools and digitization but also greater recognition of informal governance contributions.

Table 1. Summary of institutional and administrative barriers to coordinated land governance.

Barrier Category	Almaty Region	Turkestan Region
Fragmentation of responsibilities	Overlaps between environmental authorities and land departments cause delays in land allocation decisions.	Multiple agencies with unclear mandates operate in parallel, leading to duplication of efforts.
Coordination mechanisms	Lack of interdepartmental working groups or shared digital platforms.	Absence of formal coordination channels; agencies often act in isolation.
Administrative capacity	Moderate staff levels but procedural inefficiencies and contested decisions.	Weak institutional capacity at district level, staff shortages, and minimal training opportunities.
Data and information systems	Reliance on paper-based cadastre and limited integration of digital records.	Early digitization efforts underway, but outdated data and limited resources constrain progress.
Decision-making efficiency	Conflicts between agencies resolved through ad hoc political interventions.	High caseload per inspector and resource shortages slow down land-related decisions.

Table 1 highlights the institutional and administrative barriers that undermine coordinated land governance in the Almaty and Turkestan regions. In Almaty, governance challenges stem largely from bureaucratic overlaps and procedural inefficiencies. Multiple agencies share similar responsibilities without effective coordination, which leads to policy contradictions and delays in land allocation. Although administrative capacity is stronger compared to Turkestan, reliance on paper-based cadastral systems and ad hoc conflict resolution mechanisms weakens overall effectiveness.

In contrast, Turkestan faces more acute capacity constraints. District-level land departments struggle with high caseloads, staff shortages, and limited access to training, which undermines the implementation of land management policies. While the region has begun digitization initiatives, resource limitations and outdated datasets reduce their utility for decision-making. The absence of structured coordination platforms further compounds these challenges, leaving agencies to operate in isolation.

Taken together, the comparison underscores that fragmentation and weak coordination are systemic issues, but their manifestations differ regionally: Almaty is hindered by overlapping mandates among relatively stronger institutions, whereas Turkestan struggles with resource and capacity deficits. Addressing these challenges requires not only clarifying institutional responsibilities and modernizing data systems but also investing in administrative training and fostering interagency cooperation.

Effectiveness of Land Governance Tools

The effectiveness of technical and legal instruments for land governance remains limited. In both regions, outdated land cadastre systems and the lack of integrated geospatial databases were cited as major obstacles. These issues are compounded by limited enforcement of land use regulations, which weakens overall land governance.

Almaty region continues to rely heavily on paper-based land documentation, with minimal integration of digital tools. In contrast, Turkestan has initiated digitization efforts, but these remain underdeveloped due to resource constraints. Respondents noted inconsistent zoning application, irregularities in land auctions, and weak sanctions for violations as key shortcomings. A comparative overview of governance tool effectiveness in both regions is provided in *Table 2*.

Table 2. Comparative assessment of land governance tool effectiveness in Almaty and Turkestan regions.

Governance Tool / Dimension	Almaty Region	Turkestan Region

Land cadastre systems	Predominantly paper-based records; limited cross-agency interoperability.	Partial digitization with online auctions; data often outdated and inconsistent.
Geospatial data integration	Minimal integration of databases; only a minority of officials have digital access.	Resource constraints hinder updates; layers remain incomplete and fragmented.
Regulatory enforcement	Weak sanctions for violations; fines often symbolic.	Enforcement mechanisms underdeveloped; penalties rarely deter illegal land use.
Zoning and planning	Inconsistent zoning application; overlaps with environmental protected areas.	Irregular zoning implementation; weak alignment with irrigation-dependent agriculture.
Transparency of land allocation	Land auctions mostly offline; limited public access to information.	Higher share of online auctions (≈45%); but widespread mistrust among farmers due to inconsistencies.

Table 2 compares the effectiveness of land governance tools in the Almaty and Turkestan regions, revealing common structural weaknesses alongside region-specific differences. In Almaty, reliance on paper-based cadastral records and poor integration of geospatial data constrain efficient and transparent decision-making. Overlaps between agricultural and environmental zones exacerbate conflicts, while weak enforcement and limited online access to land auctions reduce institutional credibility. Although Almaty benefits from relatively stronger administrative structures, governance tools remain outdated and inconsistently applied.

Turkestan has taken initial steps toward digitization, with a larger proportion of land auctions conducted online. However, persistent resource limitations and outdated data systems undermine these efforts. Farmers frequently report mistrust in allocation outcomes, reflecting both data quality issues and weak enforcement of regulations. The region's irrigation-dependent agricultural system further complicates zoning and planning, which often fail to align with local realities.

Overall, the table underscores that both regions face challenges in modernizing land governance instruments. While Almaty is hindered by outdated but more established bureaucratic tools, Turkestan struggles with underfunded and partially implemented reforms. Effective solutions will require sustained investment in digital infrastructure, improved enforcement capacity, and stronger mechanisms for transparency and accountability across both regions.

Stakeholder Engagement and Participation

The nature and quality of stakeholder engagement differed significantly between the two regions. In Almaty, institutional mechanisms for stakeholder input—such as local councils and land commissions—exist but were often described as formalities with limited impact on outcomes. Local actors expressed concerns that decisions are frequently predetermined and that public consultations serve more as symbolic procedures than participatory processes.

Conversely, in Turkestan region, informal mechanisms such as village leaders and agricultural cooperatives played a more active role in resolving land conflicts and promoting sustainable practices, especially in rural areas. Although these mechanisms lack legal formalization, they appear to contribute to community-level coordination and knowledge-sharing.

Despite these efforts, both regions lack structured processes for integrating local and indigenous knowledge into formal land planning and governance. A need for more inclusive and responsive decision-making was emphasized by several stakeholders.

DISCUSSION

Regional Context: Land Use, Agriculture, and Socioeconomic Characteristics

Almaty and Turkestan differ markedly in geography, land use patterns, and socioeconomic conditions, which in turn influence governance efficacy and sustainability outcomes. Almaty Region features diverse terrain with mountainous areas, fertile plains, and rapidly urbanizing zones. It has a mixed agricultural system focused on cereals (wheat, barley), horticulture (fruits, vegetables), and livestock. The region benefits from relatively developed infrastructure and stronger institutional presence, which facilitates more comprehensive but sometimes contested land use planning (Ainakulov et al., 2019; OECD, 2020).

Turkestan Region is largely rural with semi-arid climatic conditions, necessitating irrigation-dependent agriculture, dominated by cotton, wheat, and melons. Infrastructure limitations, resource constraints, and lower administrative capacity characterize this region, resulting in tenure insecurity and increased vulnerability to land degradation (FAO, 2018; World Bank, 2021). Building on Aitkhozhayeva's findings (2022), the efficiency of irrigated land use in Turkestan remains critically low due to outdated irrigation technologies and insufficient water management practices, which exacerbate soil salinization and reduce crop yields. This situation highlights an urgent need for innovative water-saving technologies and improved land reclamation efforts to ensure long-term agricultural productivity and sustainability in the region.

Parameter	Almaty Region	Turkestan Region
Total area (km²)	~224,000	~117,000
Population	~1.9 million	~2.0 million
Climate	Continental, with mountainous zones	Continental, semi-arid
Dominant land cover	Forest-steppe, mountains, cropland	Steppe, irrigated cropland
Main crops	Wheat, barley, fruits, vegetables	Cotton, wheat, melons
Infrastructure quality	Moderate to high	Limited, especially irrigation
Institutional capacity	Moderate to high	Low to moderate

Institutional Coordination and Capacity

Fragmented institutional arrangements stemming from Soviet-era decentralization and recentralization reforms create significant coordination deficits in both regions. Interview data show that 81% of government officials report absence of effective inter-agency coordination platforms, resulting in policy misalignment and overlapping land use decisions. Aitkhozhayeva (2023) emphasizes that these institutional gaps hinder the implementation of innovative agricultural policies, particularly those aimed at improving irrigation management and sustainable land stewardship.

In Almaty, environmental and cadastral authorities operate with minimal interaction, leading to 15% of agricultural land parcels conflicting with protected environmental zones. Such spatial overlaps frequently require ad hoc political resolution rather than coordinated planning.

In Turkestan, administrative capacity constraints are more acute. District land inspectors manage an average caseload of over 200 active files, almost double that of Almaty inspectors. Training programs are predominantly compliance-oriented, lacking emphasis on proactive land stewardship, which reduces the efficacy of national digitization and land management reforms (Aitkhozhayeva, 2023).

Indicator	Almaty Region	Turkestan Region
% Officials citing lack of coordination	81%	81%
Average caseload per land inspector	120	210
% Inspectors receiving proactive training	42%	23%
% Agricultural land overlapping protected zones	15%	17%

Effectiveness of Governance Tools

The effectiveness of land governance tools—legal frameworks, cadastral systems, and digitization efforts—is limited by coordination deficiencies. In Almaty, cadastral records remain predominantly paper-based, with only 35% of officials reporting cross-agency access to digital data. This restricts verification speed and allows discretionary interpretation.

In Turkestan, digitization efforts have advanced with 45% of land auctions conducted online, yet resource constraints mean data layers remain outdated and inconsistent. Consequently, 42% of farmers report mistrust in official land allocation decisions. Aitkhozhayeva (2022) highlights that improving the quality of farmland, especially through integrating land reclamation practices, is critical to boosting trust and ensuring sustainable land use in Turkestan. She advocates for enhanced use of economic assessments and unified land tax methodologies to incentivize better land management practices.

Enforcement remains weak across both regions; 70% of respondents describe fines for illegal land use as symbolic and ineffective deterrents, further undermining governance credibility.

Indicator	Almaty Region	Turkestan Region
% Officials reporting interoperable cadastral data	35%	50%
% Land auctions conducted online	10%	45%
% Farmers reporting mistrust in land allocation	28%	42%
% Respondents perceiving enforcement as effective	30%	25%

Stakeholder Engagement and Participation

Stakeholder engagement shows notable regional variation. In Almaty, public hearings and consultations are often considered perfunctory, with 73% of civil society participants perceiving them as formalities lacking substantive impact. Trust in formal institutions is low (~29%).

In contrast, Turkestan relies more heavily on informal governance, where local leaders and cooperatives manage land disputes and negotiate crop rotations. Such actors are trusted by over 60% of residents but lack formal

authority, which limits the sustainability of local agreements under higher-level administrative decisions (Aitkhozhayeva, 2023). Indigenous and local knowledge integration remains marginal in both regions (<15%), representing an underutilized resource for adaptive land management.

Indicator	Almaty Region	Turkestan Region
% Civil society rating consultations meaningful	27%	55%
% Trust in formal institutions	29%	35%
% Trust in informal/local leaders	20%	62%
% Reports of indigenous/local knowledge integration	<10%	15%

Integrated Governance Feedback Loops and SLUE Outcomes

The interplay between institutional coordination, governance tools, and stakeholder participation generates reinforcing feedback loops that limit SLUE. Weak coordination restricts the functionality of technical tools; inefficient tools decrease stakeholder trust and participation; limited participation reinforces policy design disconnected from local realities, perpetuating coordination failures. Aitkhozhayeva's work underscores that without improved institutional capacity and innovative approaches to land and water management—especially in irrigation-dependent regions like Turkestan—these feedback loops will continue to undermine SLUE outcomes.

This governance feedbacks manifest differently in Almaty and Turkestan, shaped by regional differences in administrative capacity, socio-economic status, and cultural governance norms.

The findings from the Almaty and Turkestan regions reveal that institutional fragmentation, administrative capacity constraints, and uneven adoption of digital governance tools remain persistent barriers to sustainable land use efficiency (SLUE) in Kazakhstan. These results align with prior research in post-Soviet and transitional economies, where overlapping mandates, weak interagency coordination, and outdated land administration systems are common challenges [2–4]. Similar patterns have been observed in Kyrgyzstan and Uzbekistan, where decentralization without sufficient institutional capacity has led to inconsistent enforcement of land regulations [5].

The differences between the two study regions suggest that contextual factors significantly influence institutional performance. In Almaty, the existence of formal stakeholder participation mechanisms has not translated into substantive engagement, indicating that procedural compliance does not necessarily lead to participatory governance. This echoes findings from Eastern European studies, where public consultations often serve a symbolic rather than deliberative function [6]. In Turkestan, informal networks such as village leaders and agricultural cooperatives have played a more active role in resolving land disputes and promoting sustainable practices. While these mechanisms are effective in some cases, their lack of legal formalization may limit scalability and integration into official planning processes.

The limited adoption of digital land governance tools in Almaty and the resource-constrained digitization efforts in Turkestan highlight a broader technological gap. As demonstrated in Georgia's integrated geospatial cadastre system [7], digitization can improve transparency, reduce administrative delays, and facilitate data-driven decision-making. However, these benefits depend on sustained funding, technical expertise, and interoperability between agencies.

A critical insight from this study is that stakeholder engagement must move beyond tokenism. Integrating local and indigenous knowledge into formal planning could enhance policy legitimacy and adaptive capacity. For example, participatory mapping and community-based monitoring, as practiced in Mongolia's rangeland management programs [8], could be adapted to Kazakhstan's agricultural regions to bridge the gap between top-down policies and local realities.

The institutional efficiency framework developed in this study offers a diagnostic tool for identifying governance bottlenecks and prioritizing interventions. By explicitly linking administrative capacity, legal-instrument effectiveness, and stakeholder engagement, it provides a more holistic approach than sector-specific evaluations. Future applications could integrate quantitative performance indicators, such as land productivity metrics or compliance rates, to complement the qualitative assessments presented here.

CONCLUSIONS

This study critically examined the institutional mechanisms that influence sustainable land use efficiency (SLUE) within the Almaty and Turkestan regions of Kazakhstan, uncovering both systemic and region-specific barriers that hinder effective governance. The comprehensive analysis revealed that fragmented institutional arrangements, insufficient administrative capacity, outdated and inconsistent data management systems, and underdeveloped participatory frameworks collectively undermine the realization of sustainable land use outcomes.

These challenges are entrenched in historical governance legacies and exacerbated by regional disparities in socio-economic and environmental conditions.

The development and application of a region-specific governance framework—focusing on three interconnected dimensions: institutional coordination, governance tool effectiveness, and stakeholder engagement—provide a robust foundation for diagnosing the institutional weaknesses limiting SLUE and for guiding policy development tailored to local contexts. The key policy recommendations derived from this research emphasize the following priorities:

Enhancing Institutional Coordination: Strengthening interagency coordination through the establishment of formalized working groups, joint task forces, and shared digital platforms is essential to mitigate policy fragmentation, reduce duplication of efforts, and resolve conflicting land use decisions. Improved coordination will foster a more integrated governance approach that aligns environmental, agricultural, and socio-economic objectives.

Accelerating Digitization and Data Integration: Investment in comprehensive digitization of land governance processes is critical. This includes the development of integrated geospatial databases, enhancement of data interoperability across governmental bodies, and capacity-building initiatives aimed at training staff in advanced land management technologies. Such modernization efforts will increase transparency, improve decision-making efficiency, and build trust among stakeholders.

Strengthening Stakeholder Engagement and Participation: Moving beyond perfunctory public consultations, governance frameworks should adopt inclusive participatory mechanisms that actively incorporate local knowledge, empower community actors, and enable multi-level collaboration between formal and informal institutions. Enhancing the role of civil society and indigenous groups in land governance will promote adaptive management practices and improve the legitimacy and sustainability of land use policies.

Although this study concentrated on two regions with distinct geographical and institutional characteristics, the insights gained have wider relevance for other agricultural regions within Kazakhstan and transitional economies experiencing comparable governance challenges. Future research directions include integrating this qualitative governance framework with quantitative performance indicators, enabling a more comprehensive and longitudinal evaluation of SLUE across varying institutional and environmental contexts.

Ultimately, addressing the identified institutional inefficiencies and fostering adaptive, transparent, and inclusive governance structures are imperative for Kazakhstan's progress toward sustainable land use. Achieving these goals will support national land reform ambitions while contributing to broader environmental conservation and rural socio-economic development, thus aligning with global sustainability agendas such as the United Nations Sustainable Development Goals (SDGs).

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Data Availability Statement: The data presented in this study are available on request from the corresponding author.

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