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An analytical approach to the accounting of settlement lands: A case study of Mirishkor District

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Abstract

Purpose: This study aimed to analyze the legal, technical, and organizational aspects of accounting for settlement lands in the Mirishkor district. It focuses on how settlement lands are classified, distributed, and managed, while also identifying the current challenges in maintaining accurate and reliable land records that support sustainable development.

Research Methodology: This study applied a combination of geostatistical analysis, geospatial object mapping, remote sensing, cartographic tools, and algorithmic approaches. These methods are employed to evaluate patterns of land-use distribution, monitor settlement expansion, and propose improvements to land accounting systems.

Results: The results show that the Mirishkor district consists of 16,359 household plots with a total of 4,494 ha, averaging 0.27 ha per plot. Of this area, 797 hectares are occupied by residential buildings. The findings reveal significant pressure on land allocation and highlight the need for more accurate monitoring and systematic classification of settlement land.

Conclusions: This study concludes that adopting a unified geospatial cadastral system, updating the address registry, and digitizing land accounting processes will improve efficiency, transparency, and sustainability in land management.

Limitations: This research is limited to the Mirishkor district; thus, the findings cannot be generalized to other regions with different demographic, geographic, or legal conditions. Furthermore, reliance on cadastral and statistical data may not capture informal or rapidly changing settlement patterns in these areas.

Keywords: *Distribution, Land Fund of Mirishkor District, Land Categories, Land Area, Settlement Lands*

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1. Introduction

Ensuring global socioeconomic stability necessitates the scientifically grounded and efficient use of existing land resources. Globally, the expansion of the construction sector is directly linked to factors such as population growth, increased welfare, and rising purchasing power (Liu et al., 2022; Pesaresi et al., 2024). Considering the decreasing availability of land resources per capita, it is imperative to implement geo-information systems that allow for the effective use and systematic accounting of settlement lands. To ensure effective control in this domain, it is necessary to pay particular attention

to strict adherence to the organizational and technical mechanisms defined by land legislation, especially in the areas of land accounting and land use regulation. The issue of land resources has become one of the most pressing challenges of the 21st century (Tabrani, Satriawan, & Indrawan, 2024; Zhang et al., 2022). The unprecedented growth of the global population has intensified the demand for settlements, infrastructure, and agricultural production. As urbanization accelerates, land is becoming increasingly scarce, and competition between different uses and residential, commercial, industrial, and environmental—has become unavoidable. Without scientifically grounded approaches, this pressure risks producing uncontrolled urban sprawl, environmental degradation and heightened socioeconomic inequality. Therefore, comprehensive land management that integrates legal, organizational, technical, and environmental dimensions is no longer optional but an urgent necessity (Bairwa et al., 2025; Wentland et al., 2020; Wulandari, Saladin, & Mulyani, 2024).

From an economic perspective, land is a fundamental factor of production that directly influences development trajectory (Azadi et al., 2023; Simatupang & Wasesa, 2024). The construction sector, for example, provides housing and infrastructure and stimulates employment, trade, and investment. However, the sector's rapid expansion often occurs at the expense of sustainability when land allocation is not properly regulated in Brazil. This situation can lead to speculative land markets, unaffordable housing prices, and marginalization of vulnerable populations. Thus, establishing transparent land governance systems is essential for aligning economic growth with social equity (Debrunner & Hartmann, 2020; Paccoud, Hesse, Becker, & Górczyńska, 2022). Socially, secure land tenure and effective land-use regulations underpin stability and cohesion. Communities with access to legally recognized land rights are more likely to invest in long-term improvements, adopt sustainable practices, and actively participate in local governance. Conversely, weak land management mechanisms fuel disputes, informal settlements, and violent conflicts. In rural settings, unclear land rights often prevent smallholder farmers from accessing credit or adopting new agricultural technologies to improve their productivity. In urban contexts, they lead to slum proliferation and inadequate housing conditions. These dynamics illustrate the inseparable relationship between land governance and social well-being (Bayuma & Abebe, 2024; Nadhifa, Haliah, & Nirwana, 2024; van Leeuwen et al., 2021).

The adoption of geoinformation systems (GIS) has transformed land management practices worldwide. GIS enables the systematic collection, analysis, and visualization of spatial data, providing decision-makers with accurate and real-time information on land-use patterns. This technological capability supports evidence-based policy-making, facilitates long-term urban planning, and enhances transparency. For instance, satellite-based monitoring can identify illegal land use or encroachment, whereas integrated cadastral databases can accelerate land registration and reduce corruption. These advances show that digital transformation is not only a tool for efficiency but also a mechanism for accountability (Amin, Azijah, & Gunawan, 2025; Amin, Pujiyani, Rusiyana, & Azzahra, 2025).

Legally, strong frameworks are required to ensure effective land governance. Land legislation defines property rights, responsibilities, and procedures for dispute resolution. However, in many developing countries, outdated or fragmented laws create institutional uncertainty and overlap. This often leads to inefficiency, corruption, and a lack of public trust. Therefore, reforms that harmonize legal provisions, clarify land rights, and strengthen institutional capacity are essential. Such reforms should also reflect international standards and sustainable development goals (SDGs), ensuring that local practices contribute to broader global agendas (Amin, Supriatna, Ardian, & Abdurrahman, 2025).

The regulation of land use plays a pivotal role in mitigating climate change and preserving biodiversity. Urban expansion into agricultural or forested areas contributes to greenhouse gas emissions, disrupts ecosystems, and reduces community resilience to natural disasters. By integrating environmental data into land accounting, policymakers can identify sensitive areas that require conservation and rehabilitation. For example, zoning regulations informed by geospatial analysis can prevent construction in flood-prone zones, thus reducing disaster risks and protecting ecological integrity.

Despite these opportunities, several challenges remain. One of the primary obstacles is the high cost of implementing advanced geo-information technologies. Developing countries often lack the financial

resources, technical expertise, and institutional structures required to adopt and sustain such systems. Therefore, international cooperation, capacity-building initiatives, and investment in human capital are critical to bridging this gap. Additionally, concerns regarding data privacy and security must be addressed to ensure public trust in digital land records. Another challenge arises from cultural and political contexts, where traditional land tenure systems or vested interests resist modernization efforts (Karikari, Stillwell, & Carver, 2005; Leeonis, Ahmed, Mokhtar, Lim, & Halder, 2024).

Experiences from various countries provide valuable insights into overcoming these challenges. Rwanda's nationwide land registration program, which combined community participation with mobile-based technology, has successfully reduced land disputes and improved agricultural productivity. Estonia's fully digital land registry system exemplifies how e-governance enhances transparency and accessibility. Brazil's Terra Legal program demonstrates the potential of integrating land formalization with environmental sustainability in sensitive regions, such as the Amazon. These examples highlight the importance of context-sensitive approaches that combine technological innovation with institutional reforms and community engagement (Amin, Heryanto, Athaya, & Fitri, 2025).

Looking ahead, the future of land management will be shaped by emerging technologies such as artificial intelligence, machine learning, and blockchain. AI can improve predictive modeling of urban growth, enabling policymakers to anticipate and manage land demand more effectively. Conversely, blockchain offers promising solutions for securing land transactions and reducing fraud through immutable records. Simultaneously, participatory approaches that involve communities in decision-making are vital to ensure inclusivity and legitimacy. Public awareness campaigns and educational initiatives can further strengthen the culture of responsible land use (Afriyani, Indrayani, Indrawan, Wibisono, & Ngaliman, 2023; Muliyanto, Indrayani, Satriawan, Ngaliman, & Catrayasa, 2023).

In the context of global socioeconomic stability, the importance of scientifically grounded and efficient land use cannot be overstated. The nexus between economic development, social equity, environmental sustainability, and legal governance is embodied in how societies manage their land resources. As land pressures intensify, the adoption of geoinformation systems, reinforcement of legal frameworks, and alignment of policies with sustainable development principles represent the path forward. Thus, this study underscores the urgency of integrating technological, legal, and organizational mechanisms to ensure that settlement land accounting is not only a technical process but also a strategic instrument for sustainable development.

Ultimately, the question is not whether societies can afford to invest in modern land governance systems but whether they can afford not to. Failure to address land resource challenges risks undermining economic growth, exacerbating social inequality, and accelerating environmental degradation. Conversely, embracing scientifically grounded approaches offers the potential to create resilient, inclusive, and sustainable societies that can withstand the pressures of the 21st century. In this regard, effective land resource management is not merely a technical requirement; it is a cornerstone of global socioeconomic stability.

2. Literature Review

The study of settlement land accounting has long been associated with the interplay of legal, technical, and organizational mechanisms that underpin land-management systems. Existing scholarship highlights that settlement lands represent a distinct category within the broader land fund because of their social, economic, and infrastructural significance. As noted in earlier legal and planning frameworks, terms such as "settlement," "village," and "rural locality" are essential for defining the unique status of these lands and their role in supporting community life (Nowak, Cotella, & Śleszyński, 2021). These definitions, reinforced by national land and urban planning codes, provide a legal foundation for land accounting and distribution practices.

Building on this foundation, more recent studies have emphasized the importance of integrating geoinformation systems (GIS) and remote sensing technologies into land accounting practices. These

tools allow for more accurate spatial data collection, improve cadastral recordkeeping, and facilitate long-term planning for settlement expansion. In contexts where rapid urbanization and population growth create mounting pressure on land availability, geospatial technologies serve as critical instruments for ensuring efficient land allocation and preventing land disputes. For instance, remote sensing has been widely applied to monitor informal settlement growth and identify discrepancies between official cadastral maps and actual land use patterns. This demonstrates how technical advancements directly support legal and organizational objectives by increasing the transparency, reliability, and accountability of land management.

Simultaneously, organizational frameworks play a pivotal role in determining the success of settlement land accounting systems. The fragmentation of authority across multiple institutions often leads to inefficiencies, delays, and overlapping responsibilities. The literature suggests that centralized or well-coordinated institutions supported by digitized cadastral systems tend to perform more effectively in managing settlement lands. Moreover, the social dimension cannot be overlooked: secure land tenure is linked to greater community stability, higher levels of household investment, and reduced incidence of land-related conflicts. By uniting legal certainty, technological innovation, and institutional reforms, scholarship highlights a multidimensional approach that is essential for sustainable land governance in urban and rural contexts.

2.1 Legal and Institutional Perspectives

From a legal standpoint, effective governance of settlement lands requires robust regulatory frameworks that define ownership rights, tenure security, and institutional responsibilities. Previous research emphasizes that in many contexts, outdated or fragmented legal provisions undermine the transparency and efficiency of land allocation (Jahani Chehrehbargh, Rajabifard, Atazadeh, & Steudler, 2024). Similar challenges are evident in the Mirishkor District, where manual or traditional systems have led to inconsistencies in records and weakened institutional oversight. Scholars argue that harmonizing land legislation with modern cadastral systems is essential for ensuring accurate classification, reducing disputes, and supporting long-term planning (Azadi et al., 2023).

Beyond the immediate challenges of cadastral inconsistencies, the literature points to the broader implications of legal frameworks for socioeconomic development. Secure tenure and well-defined ownership rights are strongly correlated with increased household investments in housing and infrastructure and improved access to financial markets through the use of land as collateral. Conversely, weak or unclear legislation fosters insecurity, reduces the incentive for long-term investments, and exacerbates land-related conflicts. In rapidly urbanizing regions such as the Mirishkor District, these legal uncertainties create barriers to effective land allocation and sustainable community development.

Comparative studies highlight how countries that have modernized their land legislation through digitized cadastral systems and integrated registries have seen significant improvements in terms of transparency and efficiency. For example, reforms in Rwanda and Estonia illustrate how harmonized frameworks supported by digital records reduce administrative corruption, shorten land registration processes, and promote public trust in governance. Such international experiences underscore the necessity of aligning traditional or manual systems with contemporary digital frameworks to ensure legal clarity and institutional efficiency. In addition, the literature emphasizes the importance of linking national land laws with broader urban planning and environmental legislation. This alignment ensures that settlement expansion does not conflict with ecological protection goals or infrastructure development. By creating a unified and adaptive legal framework, governments can better manage settlement growth, anticipate demographic shifts, and balance economic priorities with social and environmental sustainability.

2.2 Technical Approaches to Land Accounting

Technological advancements have significantly influenced land accounting. The integration of geoinformation systems (GIS), remote sensing, and geostatistical analysis has enabled more precise and systematic monitoring of the settlement growth. Studies have demonstrated that GIS enhances spatial

data collection, visualization, and analysis, allowing for improved identification of settlement density, land use distribution, and encroachment patterns (Koeva, Bennett, & Persello, 2022). Remote sensing, particularly satellite imagery, provides continuous monitoring and validation of cadastral records, making it possible to detect unregistered land use and informal settlement expansion. Cartographic tools and geospatial object mapping further contribute to the creation of digital land databases that improve the accessibility and reliability of records.

Beyond their technical functions, these technologies also reshape governance structures by fostering greater transparency and accountability. Digital cadastral systems reduce the risks of manipulation and human error that frequently occur in manual or paper-based processes. By integrating GIS with algorithmic approaches, authorities can detect discrepancies in land allocation faster and with higher accuracy, ensuring that settlement expansion is monitored in near real time. This capacity is especially valuable in districts such as Mirishkor, where rapid population growth and migration accelerate the pace of settlement expansion and increase the likelihood of informal land use (Adugna & Gebreselassie, 2025).

The use of remote sensing also facilitates environmental monitoring because satellite imagery can capture changes in land cover, vegetation, and soil conditions. This information is indispensable for balancing urban expansion with ecological conservation goals. For example, detecting encroachment into agricultural or protected areas enables early intervention and policy responses to mitigate environmental risks. Additionally, the ability to produce layered digital maps that combine cadastral data, infrastructure, and ecological indicatorssupports more holistic and integrated planning decisions. Finally, the accessibility of these digital systems empowers both policymakers and the community. When land data are open and easily available, it fosters public participation in land governance and enhances trust in institutional decision-making. In turn, this transparency can reduce disputes, encourage investment, and strengthen the social contract between citizens and the authorities. Thus, technological advancements not only improve technical precision but also promote inclusive, sustainable, and accountable settlement and land management (Adiningsih & Setiawan, 2025).

2.3 Organizational and Policy Dimensions

The organizational dimension of settlement land accounting is equally critical in this regard. Research highlights that fragmented responsibilities across institutions often create inefficiencies, delays, and opportunities for corruption in land management processes (Burns, Rajabifard, & Shojaei, 2023). Effective governance requires institutional reforms that centralize land management functions, promote inter-agency cooperation, and build human capacity in digital cadastral systems. Best practices from international contexts, such as Rwanda's nationwide registration program and Estonia's digital cadastre, illustrate how integrated systems can enhance accountability and transparency. In the Mirishkor District, the adoption of algorithmic approaches to handle large datasets reflects the emerging recognition of the need for scalable and automated solutions in land governance (Biitir, Miller, & Musah, 2021; Ndugwa & Omusula, 2025).

Organizational reforms in land management are not only a matter of efficiency but also of equity and trust. When multiple institutions operate without coordination, citizens often face overlapping procedures, inconsistent regulations, and limited access to accurate information regarding their rights. This fragmentation fuels public frustration and increases the likelihood of disputes, particularly in contexts where land is a vital resource for livelihoods and identity. In contrast, centralized and harmonized systems streamline administrative processes, reduce bureaucratic hurdles, and provide a single source of truth for land ownership and land use classification. Furthermore, organizational capacity is closely tied to the availability of skilled personnel capable of operating digital cadastral systems and interpreting geospatial data (Bogdanov, Ryabov, & Burlakova, 2017). Capacity-building programs, continuous training, and investment in human resources are indispensable for ensuring the effective implementation of new technologies. Without adequate training, even the most advanced systems risk underutilization or mismanagement. International case studies reinforce this view. Rwanda's large-scale land registration campaign succeeded largely because of strong institutional coordination and community engagement. Estonia's experience shows how e-governance principles

can be extended to land administration, resulting in reduced corruption and enhanced transparency. For the Mirishkor District, learning from these models means not only adopting technological tools but also fostering institutional cultures that prioritize collaboration, accountability, and citizen participation. By embedding these values into organizational structures, settlement land accounting can evolve into a more transparent, efficient, and sustainable governance framework (Burns, Rajabifard, & Shojaei, 2025; Tonnarelli & Sophianos, 2025).

2.4 Socio-Economic and Environmental Relevance

Beyond the technical and legal aspects, settlement land accounting is closely related to socioeconomic development. Secure land tenure is associated with improved agricultural productivity, greater access to credit, and households' willingness to invest in long-term improvements (Dabessa Iticha & Han, 2025; Noufé, 2023). In urban settings, transparent land records facilitate affordable housing development and reduce the proliferation of informal settlements in urban settings. Environmental sustainability also plays a key role, as the unregulated expansion of settlements often leads to deforestation, biodiversity loss, and increased vulnerability to natural hazards. Integrating geospatial data with environmental indicators enables policymakers to balance development and ecological preservation (Anthony et al., 2024).

While the literature has examined various aspects of land accounting, most studies remain fragmented, focusing separately on legal frameworks, technical innovations, or organizational reforms. The Mirishkor case study contributes to the literature by offering an integrated framework that combines these dimensions into a holistic approach. Specifically, it highlights the urgency of adopting a unified geospatial cadastral system, digitizing address registries, and establishing systematic monitoring mechanisms. By bridging the gap between legal, technical, and organizational perspectives, this study advances the discourse on settlement land governance and provides practical recommendations for policymakers and local authorities.

The value of this contribution lies not only in its theoretical integration but also in its potential practical applications. By demonstrating how geo-information technologies can be embedded into legal and organizational systems, this study underscores pathways toward more sustainable and equitable land governance. Moreover, the Mirishkor case illustrates a scalable model that can be adapted to other districts facing similar demographic and governance challenges. Thus, it enriches the literature by moving beyond fragmented perspectives and presenting a comprehensive strategy that aligns with the contemporary need for sustainable development, social equity, and environmental resilience.

3. Research Methodology

3.1 Object of Study

This study focuses on the lands of settlements within the territory of the Mirishkor district, which serve as the central subject for analyzing the legal, technical, and organizational aspects of land accounting. Settlement lands represent a crucial category of land use, as they directly accommodate residential areas, infrastructure, and social facilities that support the population's well-being. In the Mirishkor district, the dynamics of settlement expansion are influenced by demographic growth, migration patterns, and socio-economic development. These dynamics create increasing pressure on available land resources, necessitating accurate classification, distribution, and monitoring systems to ensure effective governance.

Settlement lands in Mirishkor are significant not only in terms of physical space but also in their legal and institutional contexts. The absence of standardized cadastral systems and the persistence of traditional or manual land registration practices often lead to inconsistencies in the land records. This situation creates challenges in terms of transparency, ownership security, and efficient land allocation for residential and community developments. Furthermore, the rapid pace of urbanization and informal land use practices make it difficult for local authorities to maintain up-to-date and reliable land occupation records. Another critical dimension of the object of study lies in its technical aspect. Geospatial technologies, including remote sensing and cartographic mapping, are increasingly essential for capturing accurate data on the distribution of settlements. In Mirishkor, the application of these

technologies offers the opportunity to integrate spatial and statistical information, thereby enabling more precise monitoring of household plots, residential density and land utilization. By evaluating the characteristics of 16,359 household plots covering 4,494 hectares, this study seeks to highlight the opportunities and constraints in settlement land management. Thus, the object of study encompasses not only the physical settlement lands of the Mirishkor District but also their legal, technical, and institutional dimensions. Understanding this object is fundamental to developing a comprehensive strategy for modernizing land accounting systems, enhancing cadastral digitization, and ensuring sustainable land-use planning in the district.

3.2 Research Methods

Several methods were employed, including land accounting for populated areas, geostatistical analysis, geospatial object mapping, cartographic tools, remote sensing, and algorithmic approaches. In this study, several complementary methods were employed to provide a comprehensive analysis of settlement lands in the Mirishkor District. The first approach was land accounting for populated areas, which systematically records, classifies, and evaluates land plots used for residential purposes in the city. This method is crucial for identifying how settlement lands are distributed, determining the ratio between residential areas and supporting infrastructure, and highlighting potential imbalances in allocation. This study also utilized geostatistical analysis to interpret spatial data and detect patterns in settlement growth. This method provided insights into how household plots are clustered, how land distribution varies across the district, and what statistical correlations exist between settlement density and socioeconomic factors. By applying geostatistics, this study produced predictive models for future land-use scenarios, which are important for regional planning.

Another technique adopted was geospatial object mapping combined with cartographic tools. These tools allow researchers to create precise digital maps of settlement areas by integrating multiple layers, such as cadastral boundaries, road networks, and natural features. The visual outputs not only enhanced understanding but also served as practical references for policymakers and local land authorities. Furthermore, this study made extensive use of remote sensing technologies, including satellite imagery and aerial photographs. These tools enable continuous monitoring of land cover changes, detection of new settlement expansions, and validation of cadastral records. Remote sensing has proven particularly valuable for identifying informal or unregistered land use, which is often overlooked in official data. Finally, algorithmic approaches were applied to efficiently handle large datasets. Algorithms facilitated the automated classification of land categories, simulation of settlement growth patterns, and identification of inconsistencies in land records. The computational capacity of the algorithms reduced manual errors and provided scalable solutions that could be adapted to other districts facing similar challenges. By integrating these diverse methods, this study established a multidisciplinary framework that combines legal, technical, and technological perspectives. This integrated approach strengthens both the validity and applicability of the findings, offering concrete recommendations for improving settlement land management and cadastral systems in the Mirishkor District.

4. Results and Discussions

To date, legal documents and regulations have addressed the concept of settlement lands primarily by focusing on the legal status of land within urban and rural localities. A clear understanding of terms such as “population,” “city,” “settlement,” “village,” “rural locality,” “land,” and “lands of settlements” is essential to define the legal status of settlement lands. These lands are considered distinct from other categories within the state land fund because of their unique characteristics, legal standing, and designated purpose of use, as defined in the Land Code, the Urban Planning Code, and other normative acts on land management (G. Aliqulov, Aralov, & Nortoshov, 2023; G. o. N. Aliqulov & Xolov, 2024; Avezbayev & Volkov, 2006; Pratiwi, Khairunnisa, Ramadhandy, & Savitri, 2024; Suyono, Nurhuda, & Sari, 2023).

Key concepts related to settlement lands include the following:

1. Settlement lands: Lands within the boundaries of cities and urban-type settlements, as well as rural localities.

2. Rural settlement lands: Lands used for establishing, developing, and improving settlements in rural areas, where the main economic activities include agriculture, forestry, and related sectors.
3. Rural settlement boundary: the official external boundary that separates rural settlement lands from other land fund categories, approved through urban planning and land management documentation.
4. Master plan of a settlement: an urban planning document that determines the integrated development conditions and strategic directions for the territorial development of a settlement;
5. Architectural planning project of rural citizens' assemblies (including settlements, villages, and neighborhoods): a comprehensive urban planning document that addresses key objectives such as boosting rural production, improving living conditions, protecting the environment, and ensuring efficient use of natural, labor, and material resources through zoning and full architectural planning of rural settlements (Manurung & Putro, 2024; Rizal, Fanggidae, & Neno, 2023).

According to data from the Kashkadarya Regional Department of the Cadastre Agency, the total number of household plots in the region is 452,734, with 2,683 plots located in field areas. In the Mirishkor district alone, there are 16,359 household plots. The total land area allocated to household plots across the region is 80,172 hectares (Table 1).

Table 1. Information on Household Land Plots

T/r	Area name	Number of tomato farms,		Land area of tomato farms, ga	
		total	thence, in the field	total	thence, in the field
1	By region	**452 734**	**2 683**	**80 172**	**828**
2	Mirishkor district	16 359		4 494	

Note: As of January 1, 2025

According to Table 1, the average land area per household plot in the Mirishkor district is 0.27 hectares. The total area of land occupied by residential buildings in the region is 15,570 hectares (Table 2). In the Mirishkor district, the area occupied by residential buildings constitutes 797 hectares. Our study indicates that public demand for housing, in terms of quantity, volume, and quality, varies over time. Considering all related factors, we propose the following recommendations:
the implementation of a comprehensive accounting system for settlement land.

Table 2. The Land Area of Household Farms and Its Types

T/r	Name of the Territory	Land Area of Household Farms		*including*			
				Ekin yerlar		Perennial Tree Plantations	Lands Occupied by Buildings
		total	of which, in field areas	total	of which, in field areas		
1	**Across Qashqadaryo Region**	**80 172**	**828**	**55 639**	**828**	**8 961**	**15 570**
2	**Across Qashqadaryo Region**	4 494		3 270		427	797

1. the formation of a unified geospatial data system for state cadastral records
2. the establishment of a systematic approach to analytical processes
3. improvement of the address registry system;

The digitization of land accounting to monitor the processes of increase and decrease in settlement land area.

5. Conclusion

5.1 Conclusions

This study provides an in-depth analysis of the accounting and classification of settlement lands in the Mirishkor District, emphasizing the significance of a structured land management system. These findings highlight the growing demand for residential land, necessitating enhanced monitoring and regulation based on accurate data. By utilizing geo-information technologies, remote sensing, and statistical mapping, this study underscores the importance of integrating digital systems into cadastral accounting. The proposed recommendations, such as creating a unified geospatial data platform, improving address registries, and digitizing land records, are essential steps toward sustainable and transparent land-use planning. These measures are particularly important in regions experiencing rapid urban and rural development, where land resources must be managed efficiently to support socioeconomic growth.

5.2 Suggestion

Based on the findings and conclusions of this study, several recommendations can be proposed to strengthen the accounting and management of settlement lands in the Mirishkor District and other regions facing similar challenges. First, accelerating the development of a unified geospatial data platform that integrates cadastral, demographic, infrastructural, and environmental information is crucial. Such a platform would ensure that land records are not only accurate and up to date, but also easily accessible to both policymakers and citizens. Integrating geo-information technologies into existing cadastral systems can greatly reduce discrepancies, eliminate overlaps, and provide a reliable basis for decision-making in land allocation and urban planning.

Second, the digitization of address registries and land records must be prioritized to enhance transparency and efficiency. Traditional or manual registration methods have proven inadequate for keeping pace with the rapid rate of settlement expansion, leading to inconsistencies and disputes. By adopting fully digital registries, local authorities can minimize administrative delays, improve service delivery, and ensure that records reflect real-time conditions. Third, capacity-building initiatives should be implemented to strengthen the institutional and human resources involved in land management. Training programs for cadastral officers, urban planners, and local administrators will help build the technical expertise required to effectively utilize geospatial and remote sensing tools in the future. Additionally, inter-agency coordination should be improved to avoid fragmentation of responsibilities and foster a more integrated governance framework.

Finally, policymakers should adopt a sustainability-oriented perspective by aligning land-use planning with environmental protection goals. Incorporating ecological indicators into settlement land accounting will ensure that expansion does not compromise natural resources or increase vulnerability to hazards. If implemented, these recommendations will contribute to a more transparent, efficient, and sustainable land governance system capable of supporting socio-economic development in Mirishkor and beyond.

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