

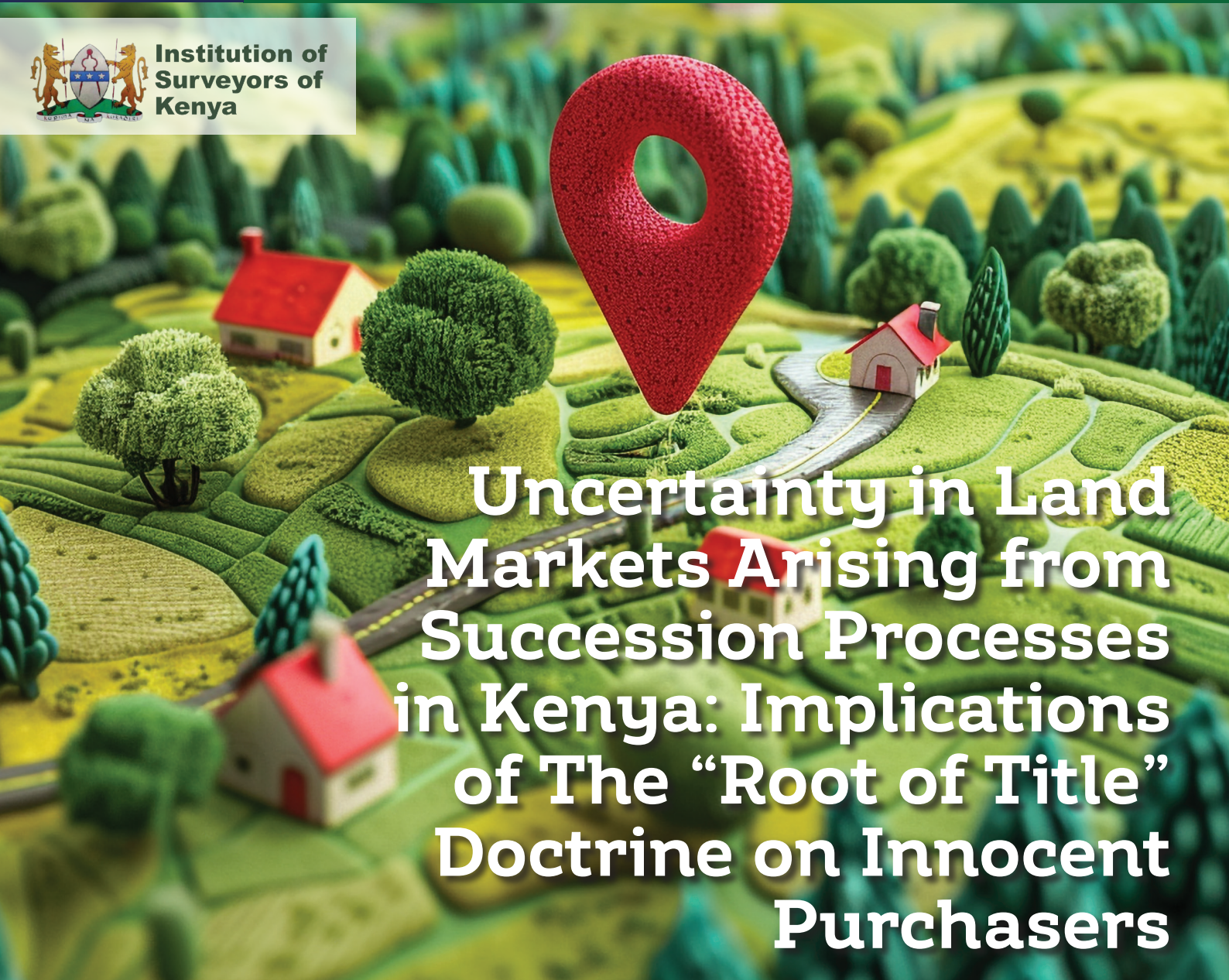
Surveyors' Journal

May 2026

A PUBLICATION OF THE INSTITUTION OF SURVEYORS OF KENYA ON LAND AND BUILT ENVIRONMENT



**Institution of
Surveyors of
Kenya**



Uncertainty in Land Markets Arising from Succession Processes in Kenya: Implications of The “Root of Title” Doctrine on Innocent Purchasers

INSIDE

**Comparative Accuracy
Assessment of GNSS and Total
Station Surveying Methods for
Small- Area Control Mappin**

**Reforming Land Governance in Kenya:
Cadastral Integrity, Digital Transformation,
Spatial Justice and the Future of the Built
Environment**



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Contents

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13



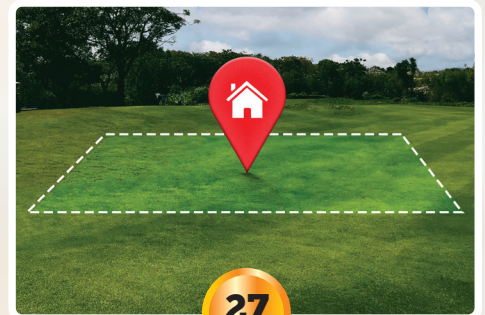
16



20

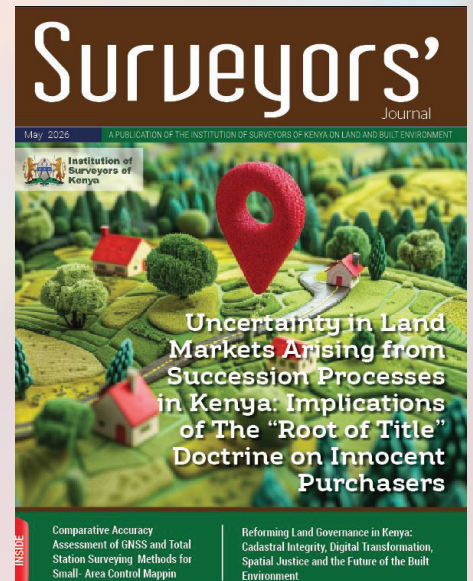


24



27

Message from the CEO	6
Message from the Chair Editorial & PR Committee	7
Message from the President	8
Uncertainty in Land Markets Arising from Succession Processes in Kenya: Implications of The “Root of Title” Doctrine on Innocent Purchasers	10
Comparative Accuracy Assessment of GNSS and Total Station Surveying Methods for Small- Area Control Mapping	14
Professional Resilience in the AI Era: Leveraging Artificial Intelligence to Enhance Structural Integrity and Engineering Surveying Practices in Kenya	17
Reforming Land Governance in Kenya: Cadastral Integrity, Digital Transformation, Spatial Justice and the Future of the Built Environment	21
Remote Sensing, Urban Heat Islands, and the Constructed Environment: Consequences for Urban Planning and Surveying in Africa	26
The Role of Geospatial Technologies in Enhancing Sustainable Urban Land Management in Rapidly Growing Cities: A Case Study of Nairobi, Kenya	32
‘Challenges in Land Subdivision and Title Processing in Kenya: The Critical Role of Licensed Surveyors in Ensuring Secure Land Tenure’	36





As the profession continues to evolve through technology, innovation, and changing industry needs, it is important that we continue to learn from one another, share knowledge, and celebrate the impact surveyors are making across the country and beyond.

It is with great pleasure that we present this edition of the Surveyors Journal. This publication is more than just a collection of articles; it is a platform that brings together the voices, experiences, achievements, and ideas shaping the surveying profession today. As the profession continues to evolve through technology, innovation, and changing industry needs, it is important that we continue to learn from one another, share knowledge, and celebrate the impact surveyors are making across the country and beyond.

I would like to sincerely thank everyone who contributed to making this edition possible, from

our writers and contributors to our partners and readers. Your support and willingness to share your insights continue to strengthen the profession. As we look forward to the second edition of the Surveyors Journal, we warmly invite members, firms, and industry stakeholders who would wish to be featured to submit their articles, stories, projects, achievements, or advertisements through communication@isk.or.ke

We look forward to building an even more engaging and informative publication together.

Dorice Angote



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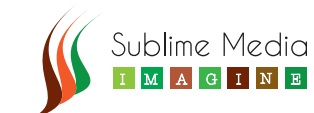
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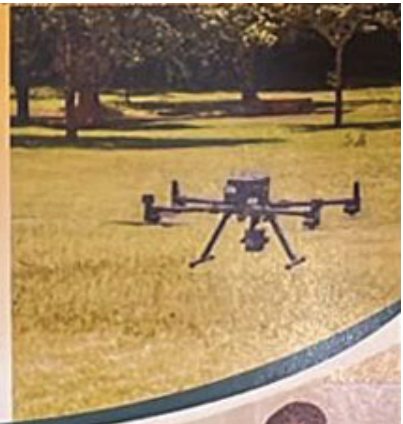
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Message from the Chief Executive Officer

This journal reflects not only the work of surveyors, but the conversations shaping Kenya's future in land, technology, and sustainable development.

It is my pleasure to present this edition of the Surveyors' Journal, a publication that continues to strengthen its place as a platform for professional reflection, knowledge sharing, and meaningful dialogue within the surveying fraternity and beyond. Each edition reminds us that surveying is not only a technical profession, but also a critical contributor to economic growth, national development, and social progress.

What makes this journal particularly valuable is its ability to bring together diverse perspectives on the issues affecting our country today. The articles featured in this edition speak to some of the most pressing conversations in land administration, urban development, technology, and professional practice. From discussions on uncertainty in land markets arising from succession processes, to reflections on reforming land governance in Kenya, the journal highlights the realities that citizens, professionals, and institutions continue to navigate in a rapidly evolving environment.

As the Institution of Surveyors of Kenya (ISK), we recognize

the importance of remaining engaged with the wider community of stakeholders, including government, academia, industry partners, and the public. This journal serves as a bridge between professional expertise and the broader conversations shaping policy and development in Kenya. It reflects our commitment to ensuring that the voice of the surveying profession contributes meaningfully to national and regional progress.

I commend the Editorial and Public Relations Committee, our contributors, reviewers, and all those who dedicated their time and effort to producing this edition. Your work continues to strengthen the visibility and relevance of the profession.

To our readers, let this journal not only inform your work, but also inspire collaboration, innovation, and forward-thinking solutions for the challenges ahead.

Together, let us continue building a profession that is responsive, respected, and prepared to contribute to a more sustainable and prosperous future for Kenya and the region.

Peter Kibet, CEO

This journal serves as a bridge between professional expertise and the broader conversations shaping policy and development in Kenya. It reflects our commitment to ensuring that the voice of the surveying profession contributes meaningfully to national and regional progress.



Message from Editorial and Public Relations Committee Chairperson

Every edition of this journal is an opportunity to strengthen professional dialogue, share new ideas, and showcase the evolving role of surveyors in shaping society.

It gives me great pleasure, on behalf of the Editorial and Public Relations Committee, to present this edition of the Surveyors' Journal. As a committee, we remain committed to ensuring that the journal continues to serve as a vibrant platform for professional engagement, thoughtful discussion, and the exchange of knowledge across the surveying fraternity and related sectors.

This publication brings together a wide range of contributions that reflect the changing realities of our profession and the broader environment within which we operate. The topics covered speak not only to technical practice, but also to the social, economic, and policy issues that continue to influence land administration, urban growth, and sustainable development in Kenya.

The articles featured in this edition explore important and timely themes, including land governance reforms, succession-related uncertainties in land markets, challenges in subdivision and title processing, and the role of geospatial technologies in supporting sustainable urban land management. Together, these discussions highlight the critical role surveyors continue to play in addressing national development priorities and improving the efficiency and transparency of land systems.

We also see strong emphasis on innovation and adaptation within the profession. Contributions examining remote sensing, modern surveying methods, and the impact of artificial intelligence reflect a profession that is evolving

alongside technological advancement. At the same time, the discussion on professional resilience in the AI era reminds us that continuous learning, ethical leadership, and adaptability will remain essential as the profession navigates future change.

As the Editorial and Public Relations Committee, we recognize that the value of this journal lies in its ability to connect people and ideas. It provides a space where practitioners, researchers, policymakers, students, and industry stakeholders can engage with issues that matter to the profession and the country at large. Through these conversations, we contribute to strengthening the visibility, relevance, and influence of the surveying profession.

I would like to sincerely thank all our authors, reviewers, editors, designers, and contributors who dedicated their time and expertise to making this publication possible. Your commitment continues to enrich professional discourse and uphold the quality of the journal.

To our readers, may this edition inspire meaningful conversations, encourage collaboration, and contribute to the continued growth and transformation of the profession.

As we move forward, let us continue to embrace innovation, share knowledge, and work together in advancing a profession that remains central to Kenya's development and future progress.

Anthony Maira Wangui



Message from the President

Through knowledge sharing, professional dialogue, and innovation, we continue to strengthen the surveying profession and its contribution to Kenya's development.

It is my honour and pleasure to present this edition of the Surveyors' Journal, a publication that continues to reflect the growth, relevance, and resilience of our profession. More than a collection of articles, this journal represents the collective voice of professionals committed to shaping better systems, better spaces, and a better future for our country and region.

The surveying profession today operates within an environment that is constantly evolving. Rapid urbanization, technological advancement, changing land dynamics, and increasing demand for sustainable development solutions continue to redefine how we work and how we contribute to society. This edition captures many of these important conversations, offering thoughtful perspectives on land governance, urban management, emerging technologies, and professional practice.

The diversity of topics covered in this journal is a reflection of the breadth of expertise within our membership. From discussions on succession-related uncertainties in land markets and challenges in title processing, to insights on geospatial technologies, remote sensing, and professional resilience in the era of artificial intelligence, the contributions in this edition demonstrate a profession that is both responsive and forward-looking.

What encourages me most is the continued willingness of our members and contributors to share their

experiences, research, and ideas. Knowledge sharing is one of the strongest foundations of professional growth, and through publications such as this, we create opportunities for learning, mentorship, and collaboration across generations and disciplines. The willingness to contribute to professional discourse is what strengthens institutions and ensures that our profession remains relevant in a changing world.

As the Institution of Surveyors of Kenya, we remain committed to advancing professionalism, promoting ethical practice, and positioning surveyors as key contributors to national and regional development. The Surveyors' Journal plays an important role in this mission by providing a platform where ideas can inform policy, inspire innovation, and encourage meaningful engagement among practitioners, academia, industry leaders, and policymakers.

I wish to sincerely thank the Editorial and Public Relations Committee, all contributors, reviewers, partners, and everyone who worked tirelessly to make this publication possible. Your dedication continues to uphold the quality and relevance of this journal.

To our readers, I encourage you to engage with the ideas presented in these pages, reflect on the conversations they raise, and continue contributing to the growth of our profession through dialogue, innovation, and collaboration.

Together, let us continue building a profession that is knowledgeable, adaptive, and prepared to meet the opportunities and challenges of the future.

Eric Nyagino

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Uncertainty in Land Markets Arising from Succession Processes in Kenya: Implications of The “Root of Title” Doctrine on Innocent Purchasers

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Land Understanding succession not merely as a private inheritance mechanism, but as a foundational component of the land administration framework, is therefore essential to appreciating the scale and significance of the uncertainty now confronting land markets.



Introduction

Certainty of title is fundamental to the stability and efficiency of land markets. Kenya's land registration system, grounded in Torrens-inspired principles, is designed to enable reliance on the register as conclusive evidence of ownership. However, recent judicial emphasis that a registered title is only as valid as the process through which it was obtained. This ruling has introduced a process-based scrutiny that extends beyond the face of the register. While this development strengthens accountability in land governance, its implications are particularly pronounced in land transmitted through succession. Given that a substantial proportion of land changes hands through inheritance. As a result, any challenges in the succession processes; especially those discovered years later have created increasing uncertainty for purchasers, professionals, and investors within the built environment sector.

Succession as a Primary Channel of Land Transmission

Succession remains one of the most significant mechanisms through which land is transferred in Kenya. Upon the death of a registered proprietor, land

devolves through probate or letters of administration under the Law of Succession Act. Following confirmation of grant, beneficiaries are registered as proprietors and acquire the legal capacity to transfer, subdivide, or otherwise deal with the land (Maranga, 2025).

From a land administration perspective, this process is treated as complete once registration is achieved. Purchasers rely on confirmed grants, official searches, and the register itself as evidence of valid ownership. In practice, transactions proceed on the assumption that the transmission process has been lawfully conducted and that the registered proprietor holds a secure and transferable interest.

However, succession processes are inherently vulnerable to defects. Omission of beneficiaries, procedural irregularities, and disputes within families frequently give rise to applications for revocation of grants under Section 76 of the Law of Succession Act. These applications may be brought long after distribution has occurred, often when land has already been transferred to third parties or subjected to further transactions.

According to Ochilo (2020), this creates

a structural weakness within the land registration system. Unlike commercial transactions, where defects are more readily traceable, succession disputes often arise from internal family dynamics that are not visible on the register. As a result, the legal validity of transmitted land may depend on factors that are neither disclosed nor reasonably discoverable at the point of transaction.

Understanding succession not merely as a private inheritance mechanism, but as a foundational component of the land administration framework, is therefore essential to appreciating the scale and significance of the uncertainty now confronting land markets.

The Innocent Purchaser Problem

The implications of defective succession processes are most evident in the position of the innocent purchaser. Traditionally, a purchaser for value who conducts due diligence; such as obtaining an official search, verifying the grant, and completing a lawful transfer would be protected under the doctrine of indefeasibility (Mutahi, 2023). The registration system is intended to provide finality, allowing purchasers to rely on the register without undertaking extensive historical investigations.

Recent jurisprudence, however, has expanded scrutiny to the “root of title,” including the underlying succession process. Where a confirmed grant is later revoked due to omission of beneficiaries or procedural defects, transactions flowing from that grant may be challenged. This exposes purchasers to risks that are not reasonably discoverable through standard conveyancing practices.

The practical consequences are significant. A purchaser may acquire land in good faith, undertake subdivision, secure financing, or develop the property, only to face a challenge years later arising from a defect in the original succession process (Mutahi, 2023). In such cases, the purchaser is effectively drawn into a dispute to which they were not party and over which they had no control.

From a market perspective, this

creates a heightened risk profile for succession-derived land. Buyers may exercise caution or avoid such parcels altogether. Financial institutions may impose stricter lending conditions or decline to accept such land as collateral. Professionals (including surveyors and conveyancing advocates) face increased exposure to liability where transactions are later challenged (Mutahi, 2023). The cumulative effect is reduced land market liquidity and delayed development within the built environment.

More fundamentally, this dynamic undermines the central purpose of the registration system. If reliance on the register is insufficient to guarantee stability of title, parties may be forced to undertake deeper investigations into historical processes, reintroducing uncertainty and transaction costs that the Torrens system was designed to

eliminate.

Conclusion

The interaction between succession law and the “root of title” doctrine presents a critical challenge for Kenya’s land governance framework. While the need to correct defective succession processes is undeniable, the resulting exposure of innocent purchasers introduces uncertainty that extends beyond individual disputes to affect the broader land market. Given the central role of succession in land transmission, unresolved tension between corrective justice and registration certainty risks undermining confidence in the system. A balanced approach; one that preserves accountability while protecting reasonable reliance on the register is essential to sustain stable land markets and support continued development within the built environment sector.

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Comparative Accuracy Assessment of GNSS and Total Station Surveying Methods for Small-Area Control Mapping



ABSTRACT

This study evaluates and compares Global Navigation Satellite System (GNSS) and Total Station surveying methods in small-area control mapping. It focuses on positional accuracy, operational efficiency, and cost implications. Control points were established and observed using both techniques, with datasets analyzed through statistical measures such as mean deviation, standard deviation, and Root Mean Square Error (RMSE). The study also considers practical factors like observation time, manpower, and workflow complexity. Results indicate that GNSS enables faster data collection with fewer restrictions, while Total Stations offer higher precision in confined environments. The findings provide practical guidance for selecting appropriate surveying methods and highlight the importance of integrating both technologies in modern surveying practice.

INTRODUCTION

Surveying plays a critical role in land administration, construction, and urban

planning by ensuring accurate spatial data collection. Traditionally, optical instruments like total stations have been used due to their high precision. However, the emergence of GNSS has transformed surveying by enabling positioning without line-of-sight requirements, increasing efficiency and flexibility.

Despite these advancements, surveyors often face challenges in selecting the most suitable method. GNSS offers speed and convenience but is affected by signal obstruction and atmospheric conditions. In contrast, total stations provide high precision but require clear visibility between points and more setup time.

The study aims to compare the positional accuracy and operational efficiency of GNSS and Total Station methods. Objectives include establishing control points, collecting and analyzing coordinate data, and evaluating workflow efficiency. The study is significant for surveyors, engineers, students, and organizations seeking to balance accuracy, cost, and efficiency. It focuses

on small-area mapping and excludes large-scale geodetic applications.

LITERATURE REVIEW

Modern surveying has evolved from optical-mechanical methods to advanced digital and satellite-based systems. Total stations and GNSS are the two dominant technologies in contemporary surveying.

Total stations combine angle and distance measurements to compute coordinates with high precision. They are reliable in obstructed environments and suitable for engineering and cadastral surveys. However, they require intervisibility, are time-consuming, and less efficient over large areas.

GNSS uses satellite signals to determine positions through trilateration. It allows rapid data collection, requires less manpower, and is ideal for large-scale surveys. However, it is affected by signal obstruction, multipath errors, and atmospheric delays.

Accuracy in surveying is evaluated using statistical measures such as mean error, standard deviation, and RMSE.



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While total stations generally provide higher short-range precision, GNSS offers acceptable accuracy with greater efficiency. Operational factors such as field time, labor, and cost also influence method selection.

The study addresses a gap in existing research by focusing on small-area practical comparisons rather than large-scale or theoretical analyses.

METHODOLOGY

The study uses a comparative experimental approach, surveying the same control points using GNSS and Total Station methods. The research was conducted in a 2-hectare open area at Jowi's Ranch, chosen for its minimal obstruction and suitability for small-scale mapping.

Ten control points (CP1-CP10) were established and marked. GNSS observations involved setting up receivers, recording antenna height, ensuring satellite lock, and logging coordinates. Total Station observations required instrument setup, leveling, prism placement, and measurement of angles and distances.

Data processing involved aligning coordinate datasets and analyzing them using GIS/CAD tools. Accuracy was assessed through RMSE, mean deviation, and standard deviation, while

efficiency was evaluated based on time, manpower, and workflow complexity. Ethical considerations included site permissions, equipment safety, and environmental responsibility.

RESULTS AND DISCUSSION

The study compared GNSS and Total Station measurements across ten control points. Differences in coordinates highlighted variations due to methodological approaches and environmental factors.

Total Station measurements showed higher consistency and precision, attributed to controlled line-of-sight observations and minimal atmospheric interference. GNSS results exhibited greater variability due to satellite geometry, signal obstruction, and atmospheric delays, though accuracy remained within acceptable limits.

In terms of suitability, GNSS proved efficient for large-area mapping due to its speed and reduced labor requirements. However, it performed less effectively in obstructed environments. Total Stations were more suitable for high-precision tasks like cadastral surveys but required more time and effort.

Error analysis showed random distribution, indicating no systematic bias and confirming proper field procedures. The findings emphasize the importance of selecting surveying methods based on project requirements and support the use of integrated approaches combining both technologies.

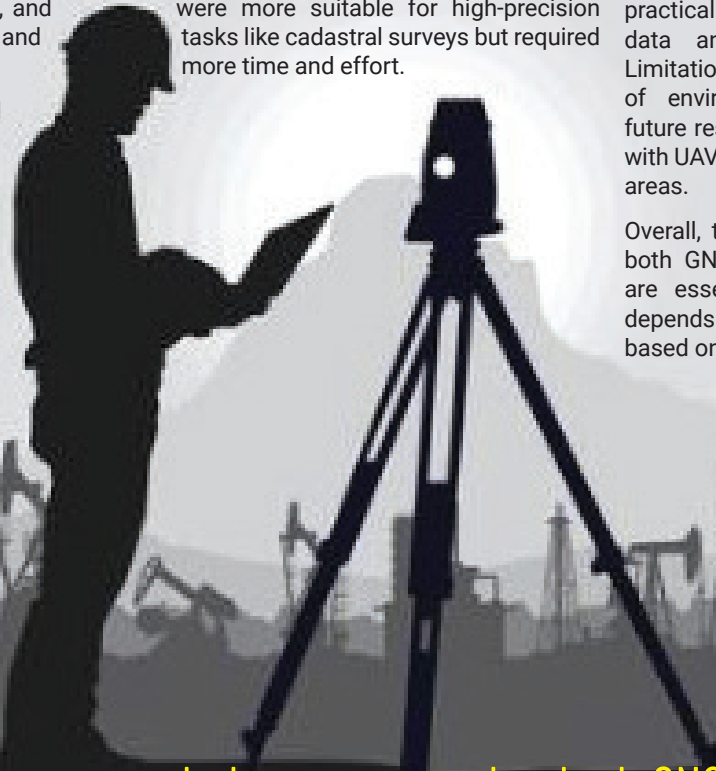
CONCLUSION AND RECOMMENDATIONS

The study concludes that Total Stations provide superior positional accuracy, with minimal horizontal and vertical errors, while GNSS offers faster data collection and operational efficiency. GNSS is suitable for large or preliminary surveys, whereas Total Stations are ideal for high-precision applications.

Recommendations include using GNSS for rapid mapping and Total Stations for detailed surveys requiring high accuracy. Surveyors are encouraged to develop skills in both technologies and adopt integrated approaches to optimize performance.

The study also highlights its value as a practical demonstration of surveying, data analysis, and reporting skills. Limitations include limited observation of environmental effects, suggesting future research could explore integration with UAV photogrammetry or larger study areas.

Overall, the research demonstrates that both GNSS and Total Station methods are essential, and effective surveying depends on selecting or combining them based on project needs.



Overall, the research demonstrates that both GNSS and Total Station methods are essential, and effective surveying depends on selecting or combining them based on project needs.



Professional Resilience in the AI Era: **Leveraging Artificial Intelligence** to Enhance Structural Integrity **and Engineering Surveying Practices in Kenya**

1. Introduction

Kenya has in recent years experienced a troubling recurrence of building collapses, particularly within rapidly urbanizing areas such as Nairobi and its metropolitan region. These incidents have raised serious concerns regarding structural integrity, regulatory enforcement, and professional oversight within the construction industry.

In early 2026 alone, multiple building collapses were reported such as the South C storey building incident, Karen, Ruiru, and Nairobi CBD with estimated losses ranging from tens of thousands to millions of USD per project.

Historically, the problem is even more significant. Between 2009 and 2019, at least 86 buildings collapsed nationwide, with cumulative structural losses exceeding USD 16–18 million. These incidents resulted in approximately 200 fatalities and over 1,000 injuries, demonstrating the severe human and economic consequences of structural failures.

Failures in surveying practices such as inaccurate positioning, lack of monitoring, or deviation from approved plans can lead to structural inconsistencies that compromise stability.

2. Problem Statement

Despite the existence of regulatory frameworks and professional standards, Kenya continues to experience frequent building collapses. This indicates persistent gaps in compliance enforcement, quality control, and professional oversight. A major contributing factor is the failure to adhere to surveying and engineering standards, including improper setting-out, lack of deformation monitoring, and inadequate site supervision.

Industry reports suggest that up to 85–87% of buildings may lack proper professional design or adequate compliance, significantly increasing the risk of structural failure. These shortcomings not only compromise safety but also result in substantial financial losses to investors, contractors, and stakeholders, undermining confidence in the construction sector.

3. Role of Engineering Surveyors in Structural Integrity

Engineering surveyors play a fundamental role in ensuring structural integrity throughout the construction lifecycle. Their responsibilities include accurate setting-out of structures, monitoring alignment and levels, verifying compliance with design specifications, and detecting structural movement or deformation.

Failures in surveying practices such as inaccurate positioning, lack of monitoring, or deviation from approved plans can lead to structural inconsistencies that compromise stability.





4. Leveraging Artificial Intelligence in Engineering Surveying Practice

Artificial Intelligence (AI) presents a transformative opportunity to enhance professional resilience in engineering surveying and construction monitoring. AI-driven systems can enable real-time analysis, predictive modeling, and automated detection of anomalies, significantly improving decision making and risk management.

Key applications include:

- ☒ Predictive Analytics: AI models can analyze historical and real-time data to predict potential structural failures before they occur.
- ☒ Automated Compliance Monitoring: AI systems can detect deviations from approved designs and flag non-compliance during construction.
- ☒ Drone and Remote Sensing Integration: AI-powered drones can capture high-resolution site data for continuous monitoring

and analysis.

- ☒ Deformation and Structural Monitoring: Machine learning algorithms can detect subtle structural movements that may not be visible through traditional methods.
- ☒ Geospatial Data Analysis: AI enhances the processing of large geospatial datasets, improving accuracy in surveying and mapping.

By integrating these technologies, surveyors can shift from reactive to proactive risk management, significantly

reducing the likelihood of structural failures.

5. Economic and Professional Implications

The financial impact of building collapses in Kenya is substantial. Individual project losses range from hundreds of thousands to millions of US dollars, while cumulative national losses run into tens of millions. In addition to direct structural losses, investors face indirect costs such as project delays, legal liabilities, compensation claims, and reputational damage.

These recurring losses highlight the urgent need to improve professional practices and adopt advanced technologies. Enhancing compliance, accuracy, and monitoring through AI can help safeguard investments, improve efficiency, and restore confidence in the construction sector.

6. Conclusion

The increasing frequency of building collapses in Kenya highlights critical weaknesses in structural integrity, regulatory enforcement, and professional practice. Engineering surveyors play a central role in addressing these challenges, and their effectiveness can be significantly enhanced through the adoption of Artificial Intelligence.

AI offers powerful tools for predictive analysis, real-time monitoring, and compliance enforcement, enabling a more resilient and proactive approach to construction management. Strengthening professional standards while leveraging AI technologies is essential for reducing structural failures, protecting investments, and ensuring sustainable development in Kenya's built environment.

The financial impact of building collapses in Kenya is substantial. Individual project losses range from hundreds of thousands to millions of US dollars, while cumulative national losses run into tens of millions.



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Reforming **Land Governance** in Kenya: Cadastral Integrity, **Digital Transformation**, Spatial Justice and the Future of the **Built Environment**



Abstract

Kenya's land sector is undergoing one of the most profound transitions since independence, driven by rapid urbanisation, digital registry reforms, infrastructure expansion, and evolving tenure systems. Despite progressive constitutional and legislative frameworks, systemic weaknesses persist in cadastral integrity, institutional

coordination, and spatial planning enforcement. This paper critically examines the structural challenges within Kenya's land governance architecture, including cadastral fragmentation, implementation of the National Land Information Management System (Ardhisasa), complexities in sectional property development, compulsory acquisition tensions, and the transition to a unified geodetic

framework. It argues that sustainable urban development requires not only digitisation but also structural harmonisation across cadastre, registration, and planning systems. The study positions surveyors as central actors in safeguarding spatial justice, strengthening public trust, and guiding Kenya's transition toward a resilient and integrated land governance system.

Errors or inconsistencies in surveying propagate through valuation systems, infrastructure development, and legal processes, ultimately affecting economic stability and social trust.



Introduction

Land governance in Kenya has historically oscillated between reform and regression. This duality reflects a legacy shaped by colonial tenure systems, post-independence redistribution policies, informal urbanisation, and fragmented institutional frameworks. The 2010 Constitution marked a significant shift by redefining land as a public resource governed by principles of equity, transparency, and sustainability. However, legal reforms have not fully resolved underlying technical and operational inefficiencies.

At the centre of this transformation is the surveying profession. Surveyors do more than define boundaries as they establish legal space, underpin property markets, and support state authority over land. Errors or inconsistencies in surveying propagate through valuation systems, infrastructure development, and legal processes, ultimately affecting economic stability and social trust.

This paper advances five key arguments:

- i. Cadastral distortions remain the primary threat to tenure security.
- ii. Digital land reforms are transformative but incomplete.
- iii. Sectional property regimes introduce complex vertical governance challenges.

- iv. Compulsory acquisition reveals tensions between constitutional rights and development imperatives.
- v. Sustainable urban development depends on geodetic harmonisation and spatial data integration.

Cadastral Fragmentation and Its Implications

Kenya's cadastral system evolved under multiple legal regimes, including general boundary systems (Registry Index Maps) and fixed boundary systems (survey plans). These parallel systems produced inconsistencies in positional accuracy, leading to overlapping parcels, boundary disputes, and misalignment between mapped and occupied land.

Urban expansion has amplified these distortions. In peri-urban regions such as Kiambu, Machakos, and Kajiado, legacy survey data often conflict with modern geodetic measurements. This becomes particularly problematic during infrastructure development, where accurate land valuation and compensation depend on precise boundary definition. Even minor discrepancies in acreage can trigger disputes, delay projects, and undermine investor confidence.

Additionally, historical reliance on

manual land registries has contributed to title duplication, document loss, and fraudulent allocations. These vulnerabilities weaken tenure security and reduce the reliability of land as collateral in financial systems.

Digital Transformation: Promise and Limitations of Ardhisasa

The National Land Information Management System (Ardhisasa) represents a major step toward modernising land administration in Kenya. By digitising records, enabling online transactions, and introducing electronic tracking systems, it enhances transparency and reduces opportunities for corruption.

However, digitisation alone does not resolve structural deficiencies. Key challenges include:

- Migration of inaccurate legacy data into digital systems
- Incomplete integration between the survey and registry modules
- Limited digital literacy among users
- Cybersecurity risks associated with centralised databases

Without a comprehensive cadastral audit and system integration, digitisation risks perpetuating historical errors in electronic form. Therefore, Ardhisasa



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must be supported by institutional reforms, technical validation processes, and continuous professional training.

Sectional Property and Vertical Land Governance

The rise of high-density developments in urban centres such as Nairobi has introduced a shift from horizontal land ownership to vertical property regimes. The Sectional Properties Act (2020) provides a framework for this transformation, but its implementation presents technical challenges.

Sectional surveying requires precise three-dimensional boundary definition, integration of architectural and cadastral data, and accurate measurement of unit areas. Even minor errors at ground level can propagate vertically, leading to disputes over ownership, common property, and building alignment.

Practical challenges include discrepancies between approved plans and constructed structures, unclear classification of shared spaces, and

weak coordination between surveyors and planning authorities. Addressing these issues requires the adoption of advanced tools such as Building Information Modelling (BIM) and stronger regulatory oversight.

Compulsory Acquisition and Spatial Justice

Compulsory acquisition remains a critical yet contentious aspect of land governance in Kenya. While constitutionally permitted for public interest, it must adhere to principles of due process, fair compensation, and transparency.

Surveying plays a central role in this process by defining affected parcels, verifying boundaries, and determining acreage for valuation. Inaccurate surveys can result in under-compensation, over-compensation, or prolonged litigation. These risks are heightened in peri-urban areas where cadastral records are inconsistent and informal occupation is widespread.

Courts in Kenya have increasingly scrutinised acquisition processes, emphasising procedural integrity and evidentiary accuracy. This underscores the need for strong coordination between surveyors, valuers, legal professionals, and government agencies.

Geodetic Reform and Spatial Data Integration

Kenya's transition to a modern geodetic reference system is essential for improving spatial accuracy and data interoperability. Legacy coordinate systems have created cumulative distortions, making it difficult to integrate datasets across regions.

A unified geodetic framework enhances infrastructure planning, environmental management, disaster response, and urban development. However, the transition process introduces challenges such as coordinate transformation discrepancies and public misunderstanding of boundary shifts.

Effective implementation requires clear transformation protocols, professional validation, and public communication strategies to maintain trust in the system.

County Planning and Informality

Devolution has transferred spatial planning responsibilities to county governments, but implementation capacity varies significantly. Many counties face limitations in GIS infrastructure, technical expertise, and enforcement mechanisms. This has led to unregulated development, zoning violations, and urban sprawl.

Informal settlements further complicate land governance. A significant portion of Kenya's urban population lacks formal tenure, limiting investment in housing and infrastructure. Regularisation efforts must balance technical accuracy with social considerations to avoid displacement and speculative exploitation.

Participatory mapping, community engagement, and integration of informal areas into formal planning systems are essential for achieving spatial justice.

Professional Ethics and Leadership

Ethical integrity is fundamental to effective land governance. Survey manipulation, boundary falsification, and collusion undermine public trust and compromise the entire cadastral system.

Strengthening professional accountability requires continuous training, transparent disciplinary mechanisms, and integration of digital audit trails. However, ethical compliance must be internalised within the profession rather than imposed externally.

Surveyors must also assume leadership roles beyond technical practice by contributing to policy development, institutional reform, and national geospatial strategies.

Conclusion

Kenya stands at a critical juncture in its land governance trajectory. Digital transformation, urban expansion, and infrastructure development present both opportunities and risks. Sustainable progress depends not only on technological innovation but also on institutional coherence, cadastral accuracy, and ethical professionalism.

Surveyors are uniquely positioned to anchor this transformation. By ensuring geodetic integrity, supporting digital reforms, and promoting spatial justice, the profession can shape a land governance system that is transparent, equitable, and resilient.

Ultimately, land governance integrity is a foundational pillar of national development. Where it is strong, investment thrives, and cities grow sustainably. Where it is weak, uncertainty prevails. Kenya's future built environment will depend on how effectively this foundation is strengthened.



Remote Sensing, Urban Heat Islands, and the Constructed Environment: Consequences for Urban Planning and Surveying in Africa

To link heat to land-cover characteristics, researchers use LULC classification alongside spectral indices such as NDVI for vegetation, NDBI for built-up surfaces, NDWI for water, and NDMI for moisture

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Abstract

Urban heat islands (UHIs) are intensifying as rapidly growing cities expand, increasing thermal stress, energy demand, and health inequities. Remote sensing and geographic information systems (GIS) make it possible to measure the links between land use, built-up intensity, vegetation, and land surface temperature (LST) over large areas and long periods. Evidence from Asian and Eastern European cities shows that urbanization, vegetation loss, and impervious surfaces significantly increase UHI intensity and degrade thermal conditions, especially in low-income neighborhoods. Although African UHI research remains limited,

these methods and findings are directly relevant to African planners and surveyors involved in land-use mapping, development control, and infrastructure design.

This article summarizes key remote sensing techniques for mapping UHIs and land-use/land-cover (LULC) change, reviews major findings on the relationship between built form, vegetation, and heat, and outlines how African surveying professionals can support climate-responsive planning and climate justice.

Keywords: urban heat island; remote sensing; land surface temperature; LULC change; climate justice; African cities; surveying; Kenya; urban planning

Urban heat and inequality

Cities are usually warmer than surrounding rural areas because



Cities are usually warmer than surrounding rural areas because impervious materials, reduced vegetation, altered radiation balance, and dense urban form combine to produce the UHI effect.

impervious materials, reduced vegetation, altered radiation balance, and dense urban form combine to produce the UHI effect. Satellite records show that LST and UHI intensity have strengthened over the last three decades, with some of the most severe impacts concentrated in low-income neighborhoods that already face environmental burdens. Climate change makes this worse by increasing the frequency and severity of heatwaves, especially where housing quality, green space, and adaptive capacity are limited.

African cities face these risks under rapid urbanization, informal settlement growth, weak development control, and limited integration of climate concerns into planning and building regulation. At the same time, planners and surveyors in Africa can now access free satellite data, open-source GIS tools, and UAV technologies that make it possible to

monitor LULC change, UHI intensity, and vulnerable populations even where ground monitoring networks are sparse.

Remote sensing methods

LST is central to UHI analysis because it provides a consistent measure of surface thermal conditions from thermal infrared sensors. Landsat is particularly valuable because it combines moderate spatial resolution, a long historical archive, and free access, making it useful for multitemporal urban studies. In most studies, SUHII is estimated by comparing mean urban LST with nearby rural or vegetated reference zones, while indices such as UTFVI are used to express relative thermal stress.

To link heat to land-cover characteristics, researchers use LULC classification alongside spectral indices such as NDVI for vegetation, NDBI for built-up surfaces, NDWI for water, and NDMI for moisture. Machine-learning approaches, especially random forest, often outperform traditional classifiers because they can combine spectral bands, indices, texture, and other variables with high accuracy. Studies from Lahore, Algiers, and Ho Chi Minh City show that these methods can effectively detect urban expansion, impervious surface growth, and associated rises in LST.

Regression, correlation, and machine-learning models are then used to explain



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the relationships between LST and land-cover variables. In Agra, for example, vegetation measured through NDVI was strongly negatively correlated with LST, while built-up intensity measured through NDBI was positively associated with higher temperatures. Similar patterns appear across South Asian and Eastern European case studies, confirming that built-up expansion and vegetation decline consistently intensify UHI conditions.

Implications for African cities

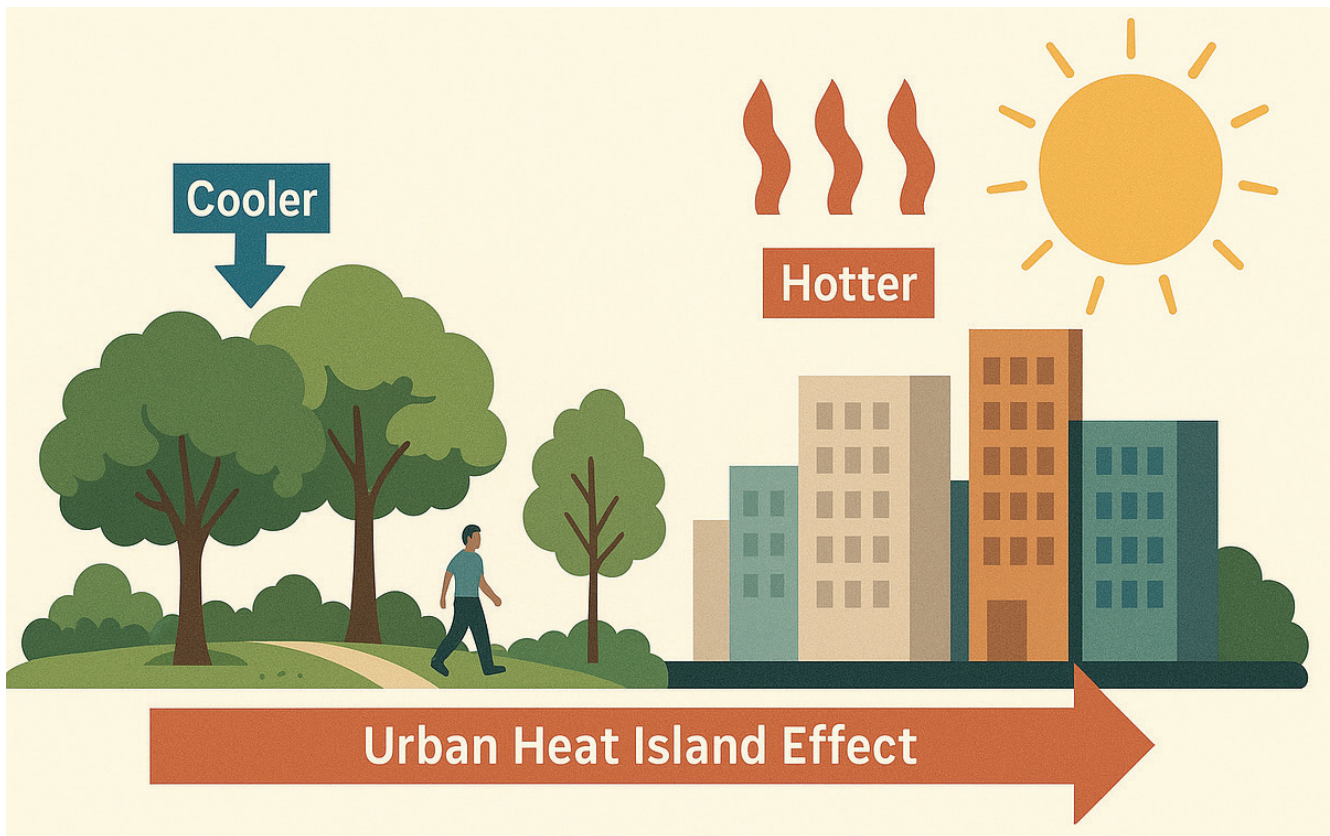
Although African UHI literature is still limited, available studies from Nairobi, Mombasa, Nakuru, and other cities show similar dynamics. Urban expansion into peri-urban agricultural land, riparian corridors, and coastal areas has reduced vegetation, increased impervious cover, and raised LST in newly urbanized neighborhoods. In Mombasa's CBD, dense construction, humidity, and waste heat have created especially severe thermal conditions.

These findings show that UHI is not a minor environmental issue but a major planning concern affecting public health, energy demand, stormwater management, and urban livability. UHI analysis can help planners decide where high-density development should occur, where minimum green-space and tree-cover requirements are needed, and which wetlands, riparian corridors, and other blue-green assets should be protected. It can also help priorities greening and upgrading in informal settlements and other neighborhoods that experience high heat exposure and low adaptive capacity.

Role of surveyors

Surveyors are well placed to connect satellite-based UHI analysis with practical planning and design decisions because they already work with spatial data, coordinate systems, cadastral information, and field measurement. By combining satellite imagery with UAV surveys, LiDAR, and ground observations, they can produce detailed maps of built form, tree cover, roof types, street canyons, and surface materials that influence local microclimates.

This creates several professional opportunities. Surveyors can support detailed heat-vulnerability mapping by integrating LST, SUHII, property ownership, infrastructure, population



density, and service access into a common georeferenced framework. They can also contribute to monitoring and evaluation by repeating UAV or field surveys in designated heat-management zones to assess the effects of tree planting, cool roofs, permeable paving, and other interventions over time.

Kenyan planning and policy context

Kenya already has a growing evidence base and an emerging policy framework that can support mainstreaming UHI management into planning and building control. Research from Nairobi shows a clear relationship between urbanization, vegetation loss, impervious growth, and increased LST, while work from Mombasa identifies dangerous heat build-up in densely developed coastal urban areas. These findings are reinforced by micro-scale studies showing that suitable plant species and planting arrangements can improve thermal comfort in Nairobi.

The Climate Change Act, 2016 as revised in 2023, provides a national framework for climate-resilient and low-carbon development, while draft Green and Resilient Buildings Regulations seek to

encourage energy-efficient and climate-responsive building practices. Together with county spatial planning powers, these instruments create a practical basis for integrating UHI management into county plans, zoning controls, and development approval systems.

A practical county-level approach can follow four steps. First, counties can prepare baseline UHI assessments using Landsat or Sentinel data, NDVI/NDBI analysis, and LST retrieval on platforms such as Google Earth Engine. Second, surveyors can ground-truth priority areas using UAVs and field surveys to capture detailed data on tree cover, roof materials, building form, and surface types. Third, counties can incorporate resulting heat and vulnerability maps into county spatial plans by designating heat-management zones with standards for canopy cover, permeable surfaces, shading, and reflective or vegetated roofs. Fourth, these requirements can be operationalized through building approval checklists and inspection procedures.

Conclusion

Remote sensing research over the

last three decades shows clearly that urbanization intensifies UHIs by increasing impervious surfaces, reducing vegetation, and altering urban morphology. Studies from Asia and Eastern Europe demonstrate that as built-up areas expand and vegetated land declines, LST, SUHII, and thermal stress all rise, with especially serious consequences for dense and low-income neighborhoods. Emerging African and Kenyan evidence points in the same direction.

For African planners and surveyors, the message is practical and immediate. Remote sensing-based UHI analysis should be integrated into regular planning support, development control, and infrastructure decision-making. Surveyors should also help design, implement, and monitor nature-based and climate-responsive interventions such as blue-green networks, cool corridors, shading strategies, and climate-sensitive building design. In Kenya, the combination of growing evidence, open geospatial tools, and an evolving climate policy framework provides a strong opportunity to make cities cooler, fairer, and more resilient.

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The Role of Geospatial Technologies in Enhancing Sustainable Urban Land Management in Rapidly Growing Cities: A Case Study of Nairobi, Kenya

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Abstract

Rapid urbanisation in developing countries has intensified pressure on land resources, exposing weaknesses in traditional land administration systems. In Nairobi, Kenya, this growth has contributed to informal settlements, land-use conflicts, fragmented records, and environmental stress. This paper examines how geospatial technologies, specifically Geographic Information Systems (GIS), Global Navigation Satellite Systems (GNSS), and remote sensing can enhance sustainable urban land management. Using a mixed-methods approach involving surveys, interviews, spatial analysis, and policy review, the study evaluates the effectiveness of these technologies in improving planning accuracy, transparency, and decision-making. Findings indicate that geospatial technologies significantly improve land administration efficiency and sustainability outcomes. However, challenges such as institutional fragmentation, limited technical capacity, and inadequate data integration constrain full implementation. The paper proposes an integrated geospatial framework to strengthen land governance and professional surveying practice in rapidly urbanising cities.

Introduction

Urbanisation is accelerating globally, particularly in developing countries where cities are expanding faster than planning systems can respond.

Nairobi exemplifies this trend, experiencing rapid population growth, increased land demand, and intensified infrastructure development. While urban expansion creates economic opportunities, it also generates challenges including informal settlements, tenure insecurity, inefficient planning systems, and environmental degradation.

Traditional land management approaches are largely dependent on manual records and fragmented data systems that are increasingly inadequate in addressing these complex challenges. Effective land governance today requires accurate, accessible, and integrated spatial data to support evidence-based decision-making.

Geospatial technologies have emerged as essential tools in modern land administration. GIS enables spatial analysis and visualisation; GNSS enhances survey accuracy; and remote sensing provides up-to-date imagery for monitoring land-use changes. Globally, countries that have integrated these technologies into land governance systems report improved efficiency, transparency, and sustainability.

Despite ongoing reforms in Kenya, including digital land registries and cadastral modernisation, adoption of geospatial technologies remains uneven. This study investigates their role in improving sustainable urban land management in Nairobi, focusing on their practical application, benefits, and implementation challenges.



Urban Land Management Challenges in Nairobi

The study identifies several persistent challenges affecting land management in Nairobi. These include fragmented land records, expansion of informal settlements, frequent land disputes, delays in planning approvals, and weak inter-agency data sharing. Fragmentation of land information systems emerged as the most critical issue, with different institutions maintaining separate and often inconsistent datasets.

Manual and partially digitised systems further slow decision-making processes and contribute to inefficiencies in land administration. As a result, disputes over land ownership and boundaries remain common, undermining tenure security and investment confidence.

Adoption of Geospatial Technologies

The findings reveal a growing adoption of geospatial technologies among land and built environment professionals. GIS and GNSS are the most widely used tools, reflecting their central role in modern surveying and planning practices. Remote sensing technologies are moderately adopted, while advanced tools such as drone mapping (UAVs) are still emerging due to cost and regulatory

limitations.

This trend indicates a gradual transition from traditional surveying methods toward digital and data-driven practices. However, adoption levels vary across institutions, highlighting disparities in access to technology and technical capacity.

Impact on Land Administration Efficiency

Geospatial technologies have significantly improved efficiency in land administration. Professionals reported enhanced mapping accuracy, faster survey processes, improved planning decisions, and reduced boundary disputes. GNSS-based surveys, in particular, have reduced fieldwork time and increased positional accuracy compared to conventional methods.

Additionally, digital spatial systems improve transparency by enabling better documentation, tracking, and accessibility of land information. These improvements contribute to more reliable land governance and increased public trust in land administration processes.

Contribution to Sustainable Urban Planning

Geospatial technologies play a crucial role in promoting sustainable urban

development. Spatial analysis enables planners to monitor urban expansion, identify environmentally sensitive areas, enforce zoning regulations, and plan infrastructure more effectively.

Remote sensing data allows continuous monitoring of land-use changes, supporting proactive planning interventions. This capability is particularly important in rapidly growing cities like Nairobi, where land-use dynamics change quickly.

By enabling data-driven decision-making, geospatial technologies help balance economic development with environmental protection and social equity, which are key pillars of sustainable urban planning.

Barriers to Effective Implementation

Despite their benefits, several barriers limit the full utilisation of geospatial technologies in Nairobi. High implementation costs remain a significant constraint, particularly for smaller organisations. Limited technical skills among professionals further hinder effective use of advanced tools.

Institutional fragmentation also poses a major challenge. Many agencies operate independently, maintaining

separate spatial databases that are not interoperable. This lack of integration leads to duplication, inconsistencies, and inefficiencies in land administration.

Additional challenges include data accessibility restrictions, lack of standardised data formats, and resistance to organisational change. These barriers highlight the need for coordinated institutional frameworks and capacity-building initiatives.

Implications for Professional Practice

The adoption of geospatial technologies is transforming the role of land surveyors and built environment professionals. Traditional surveying skills are no longer sufficient; professionals must now possess competencies in GIS analysis, spatial data management, and remote sensing interpretation.

Clients increasingly demand digital outputs and data-driven insights, reflecting a broader shift toward digital land governance. This transformation underscores the importance of continuous professional development and integration of advanced geospatial training in academic curricula.

Conclusion

This study demonstrates that geospatial technologies are essential for improving sustainable urban land management in rapidly growing cities. In Nairobi, these technologies have enhanced spatial accuracy, efficiency, transparency, and planning outcomes.

However, technology alone is not sufficient. Effective implementation requires strong institutional coordination, integrated data systems, supportive policy frameworks, and continuous capacity building. Without these elements, the full potential of geospatial technologies cannot be realised.

The findings highlight the need for a holistic approach that combines technological innovation with governance reforms. By doing so, Nairobi, and other rapidly urbanising cities can achieve more sustainable, efficient, and inclusive land management systems.



The findings highlight the need for a holistic approach that combines technological innovation with governance reforms. By doing so, Nairobi, and other rapidly urbanising cities can achieve more sustainable, efficient, and inclusive land management systems.

Recommendations

To maximise the benefits of geospatial technologies, the following actions are recommended:

- **Integration of Land Information Systems:** Develop a unified, interoperable land information system linking cadastral, planning, and registration databases.
- **Strengthening Institutional Coordination:** Promote collaboration between national and county governments and standardise data-sharing protocols.
- **Capacity Building:** Invest in training programs to enhance

technical skills in GIS, remote sensing, and spatial analysis.

- **Infrastructure Investment:** Support acquisition of modern surveying equipment and digital platforms to improve data management.
- **Policy and Regulatory Reform:** Establish clear guidelines for digital land governance, including standards for data sharing and emerging technologies.
- **Promotion of Sustainable Planning:** Integrate geospatial analysis into routine urban planning processes to support informed decision-making.



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'Challenges in Land Subdivision and Title Processing in Kenya: The Critical Role of Licensed Surveyors in Ensuring Secure Land Tenure'



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Abstract

Secure land tenure is crucial for economic development, social stability, and investment in Kenya. However, land subdivision and title processing systems continue to face systemic challenges, including administrative bottlenecks, digitization gaps, technical survey issues, historical inconsistencies, and weak institutional coordination. These challenges result in procedural delays, disputes over ownership, and limited public trust in land governance. Licensed surveyors play a vital role in mitigating these issues by ensuring accurate

boundary determination, statutory compliance, professional accountability, and dispute prevention. This article examines the legal and institutional framework for land subdivision, analyses key challenges, and provides policy recommendations for improving efficiency, transparency, and equitable land administration.

Introduction.

Land is one of Kenya's most valuable assets, underpinning agricultural production, housing, infrastructure development, and commercial investment. With rapid urbanization and demographic pressures, the demand for land subdivision has increased significantly, shining a spotlight on

inefficiencies in title processing and registration. The subdivision process, which involves dividing a large parcel into smaller plots and securing individual title deeds, is governed by multiple laws and institutions. However, despite clear statutory frameworks, landowners, professionals, and authorities often encounter delays, procedural barriers, and disputes, undermining confidence in land tenure security and economic growth.

Institutional frameworks such as the Land Registration Act (2012), Land Act (2012), and Physical and Land Use Planning Act (2019) provide the legislative basis for title issuance, subdivision approvals, and land use compliance. Yet, gaps in digitization and inconsistencies in data management complicate implementation. Licensed surveyors are indispensable actors whose professional expertise is essential to ensure accuracy, compliance, and integrity in the subdivision process. This paper explores the practical challenges of land subdivision and title processing in Kenya and highlights the critical contribution of licensed surveyors in achieving secure land tenure.

Legal and Institutional Framework Governing Subdivision in Kenya.

Land subdivision and title processing in Kenya operate within a complex, multilayered legal and institutional architecture designed to secure property rights, regulate land use, and promote orderly development. This framework reflects constitutional principles introduced under the Constitution of Kenya (2010), particularly those relating to land classification (public, private, and community land), devolution of governance, transparency, and equitable access to land. Subdivision is therefore not merely a technical surveying exercise but a legally structured transformation of proprietary interests that must comply with statutory, regulatory, and institutional mandates.

1. Constitutional Foundation

The legal regime governing subdivision

Gaps in digitization and inconsistencies in data management complicate implementation. Licensed surveyors are indispensable actors whose professional expertise is essential to ensure accuracy, compliance, and integrity in the subdivision process.

is anchored in the Constitution of Kenya (2010), which restructured land governance by introducing devolved government and establishing institutions such as the National Land Commission (NLC). Article 60 sets out principles of land policy, including equitable access, security of land rights, sustainable management, and transparent administration. Article 62–64 categorizes land into public, community, and private land, while Article 67 establishes the National Land Commission to manage public land and recommend land policy reforms.

These constitutional provisions shape how subdivision processes are administered, particularly in ensuring that subdivision does not violate public interest, planning standards, or constitutional land principles.

2. Core Statutory Framework

(a) Land Registration Act, 2012

The Land Registration Act (LRA) governs the registration of interests in land and the issuance of title deeds. It establishes the legal foundation for recording subdivided parcels in the land register. Once a subdivision is approved and survey plans authenticated, the resulting parcels must be registered under the LRA to generate separate titles.

Key functions under the Act include:

- Establishment and maintenance of land registries.
- Authentication of mutation forms and deed plans.
- Rectification of errors in the register.
- Protection of indefeasibility of title, subject to limited exceptions such as fraud or illegality.

Subdivision becomes legally effective only after registration. Thus, the LRA transforms technical survey outputs into legally recognized property rights. Without compliance with this Act, a subdivided parcel cannot obtain independent legal status.

(b) Land Act, 2012

The Land Act complements the Land Registration Act by regulating land tenure systems, transactions, and administration. It provides procedural safeguards for allocation, transfer, leasing, and conversion of land. In subdivision contexts, the Act ensures that:

- Consent requirements (e.g., spousal consent, lender consent where land is charged) are satisfied.
- Public land is not unlawfully converted into private parcels.
- Compulsory acquisition or public purpose reservations are protected.

The Act also reinforces the role of the National Land Commission in managing



public land, ensuring that subdivision does not interfere with reserved or community land rights. It strengthens transparency in land dealings and guards against irregular allocations.

(c) Physical and Land Use Planning Act, 2019 (PLUPA)

Subdivision must comply with planning and zoning requirements under the Physical and Land Use Planning Act (PLUPA). This statute operationalizes spatial planning at both national and county levels and is particularly significant in the context of devolution.

Before subdivision approval:

- The proposed layout must conform to zoning regulations.
- Minimum parcel sizes must meet planning standards.
- Access roads, public utilities, and service corridors must be provided.
- Environmental and infrastructure

considerations must be assessed.

County governments, as planning authorities, evaluate subdivision proposals against approved development plans. This ensures that land fragmentation does not undermine infrastructure provision, environmental sustainability, or urban design principles. PLUPA therefore integrates subdivision into broader spatial development strategies.

(d) Survey Act (Cap 299)

The Survey Act regulates cadastral surveying and mandates that only licensed surveyors conduct official surveys. It governs:

- Preparation and authentication of survey plans.
- Maintenance of geodetic controls.
- Approval of mutation forms and deed plans.
- Standards of accuracy and technical compliance.

Under this Act, survey documents must be submitted to the Director of Surveys for examination and approval before registration. This step ensures that newly created parcels align with the national cadastral system and prevents duplication, overlap, or spatial inconsistencies. The Survey Act thus provides the technical integrity backbone of the subdivision framework.

3. Institutional Architecture

Subdivision in Kenya is administered through interconnected national and county institutions, reflecting the country's devolved governance structure.

(a) Ministry of Lands and Physical Planning

The Ministry provides national policy direction, legislative oversight, and administrative coordination. It oversees:

- Land registries.
- Survey departments.



- Policy formulation.
- Implementation of digital land systems (e.g., Ardhisasa).

The Ministry ensures consistency in land administration standards across counties and coordinates reform initiatives aimed at improving efficiency and transparency.

(b) National Land Commission (NLC)

The National Land Commission manages public land on behalf of national and county governments. In subdivision matters, its relevance includes:

- Oversight of public land allocations.
- Investigation of historical land injustices.
- Advisory role in land policy reforms.
- Dispute resolution involving public land.

The NLC ensures that subdivision does not encroach upon public land reserves, infrastructure corridors, or protected areas.

(c) County Governments

Under devolution, county governments are responsible for physical planning and development control. Their roles include:

- Reviewing and approving subdivision applications.
- Ensuring compliance with local zoning regulations.
- Conducting site inspections.
- Collecting planning-related fees.

Counties act as the first gatekeepers in subdivision approval. Their planning decisions must align with county spatial plans and national land policies.

(d) Professional Regulatory Bodies

Professional standards are enforced through regulatory institutions such as the Institution of Surveyors of Kenya (ISK) and relevant statutory boards. These bodies:

The Land Registration Act and Land Act establish legal ownership structures; the Physical and Land Use Planning Act embeds subdivision within spatial governance; and the Survey Act safeguards technical accuracy. Institutional actors—from the Ministry of Lands and National Land Commission to county governments and professional bodies—perform complementary roles within this system.

- License qualified surveyors.
- Enforce ethical standards.
- Oversee continuous professional development.
- Investigate complaints and malpractice.

Professional regulation ensures technical competence and ethical accountability in subdivision processes. Because cadastral surveys directly affect property rights, strong professional oversight is critical to maintaining trust in land records.

4. Inter-Institutional Coordination and Overlaps

Although the framework is comprehensive, it is multilayered and sometimes fragmented. Subdivision typically requires sequential engagement with:

1. Licensed surveyors (technical preparation).
2. County planning offices (planning approval).
3. Director of Surveys (authentication of survey plans).
4. Land registry (title registration).
5. National Land Commission (where public land issues arise).

While this layered approach promotes checks and balances, it may also create procedural bottlenecks if coordination is weak. Overlapping mandates between national and county institutions sometimes result in delays

or jurisdictional ambiguity. Effective implementation therefore depends on strong institutional cooperation and clear procedural guidelines.

5. Functional Purpose of the Framework

Collectively, these legal instruments and institutions serve several core objectives:

- **Legal certainty:** Ensuring that subdivided parcels have clear, enforceable titles.
- **Planning control:** Preventing chaotic land fragmentation.
- **Technical integrity:** Maintaining an accurate and unified cadastral system.
- **Public interest protection:** Safeguarding public land and environmental resources.
- **Accountability:** Providing oversight and mechanisms for redress.

The framework is designed not merely to regulate land transactions but to integrate subdivision into broader governance, development, and constitutional land policy goals.

Therefore, the legal and institutional framework governing land subdivision in Kenya is intentionally multilayered to balance technical precision, legal validity, planning control, and public accountability. The Land Registration Act and Land Act establish legal ownership structures; the Physical and Land Use Planning Act embeds subdivision within spatial governance; and the Survey

Act safeguards technical accuracy. Institutional actors—from the Ministry of Lands and National Land Commission to county governments and professional bodies—perform complementary roles within this system.

While the framework is robust in design, its effectiveness ultimately depends on institutional coordination, professional competence, and administrative efficiency. When properly implemented, it provides the structural foundation for secure land tenure, orderly development, and sustainable land governance.

Key Challenges in Land Subdivision and Title Processing.

Administrative Bottlenecks and Delays.

Administrative bottlenecks are among the most pervasive issues in land subdivision. Applications for subdivision often go through multiple layers of review – from county planning offices to national land registries – with each stage requiring manual verification, physical file movement, and multiple endorsements. Stakeholders in the real estate sector have publicly decried unexplained delays, with title registration processes extending for six months or more in some cases, causing financial and legal hardship for landowners and developers (The Star, 2023).

Such bureaucratic slowdowns can result from inconsistent procedures across counties, lack of standardized documentation, and gaps in interdepartmental communication.

Manual handling of files compounds delays and increases the risk of lost or misplaced records. Procedural streamlining, clear institutional timelines, and digitized workflows are essential to addressing these challenges.

Digitization and Land Information System Challenges.

Kenya's transition to digital land administration through platforms like Ardhisasa was intended to modernize land records and improve access to title information. However, the process has been marked by implementation challenges. The system has experienced incomplete data inclusion, user difficulties, and technical barriers that undermine its effectiveness (Kenya Law, 2025).

The platform's rollout has been uneven, with not all counties fully integrated into the system. Incomplete digitization of historical records and resistance from professionals accustomed to paper-based systems limit uptake and effectiveness. Technology adoption in land administration requires infrastructure, training, and change management strategies.

Historical Inconsistencies, Fraud, and Double Allocation.

Fragmented data systems and incomplete historical records pose considerable challenges. Many foundational records remain undigitized, and inconsistent entries across county and national databases lead to disputes over ownership. Fragmented records across agencies make land history verification difficult, contributing to multiple allocations of the same land parcel, undermining investor confidence and inflating disputes (Mwakilishi, 2025).

Illegal subdivision and fraudulent documentation are serious concerns that have been chronicled in sector analyses. Weak enforcement of planning and land use laws, coupled with corruption and collusion with officials, enables unauthorized subdivisions and issuance of multiple title deeds. These practices

erode trust and trigger legal battles that burden land administration systems (Ultimate Forensic Consultants, 2025).

Technical Survey Challenges.

Accurate cadastral surveys are the foundation of secure titles, yet technical challenges persist. Errors in boundary determination, inconsistent datum application, and the prevalence of unqualified practitioners in some cases lead to disputes and rework. Licensed surveyors are essential in mitigating these risks, but issues such as limited professional capacity and licensing bottlenecks can restrict their availability (Business Radar, 2025).

Case-Based Discussion: Real Cases from Kenya

Case 1: Kisumu Irregular Subdivision (2024)

In *Republic v Kisumu County Land Registrar & Another; Otieno & 29 others* (Judicial Review E001 & E005 of 2023), landowners challenged the land registrar's investigation into irregular subdivisions. Parcels had been expanded from 1.9 ha to over 38 ha, overlapping government-acquired leasehold land. The court emphasized that factual disputes over title validity required a civil suit rather than judicial review. This case highlights how irregular subdivision practices and potential technical survey errors can create overlapping rights and trigger legal intervention (Jibu Docs, 2024).

Case 2: Fraudulent Land Transfers (2025)

Several 2025 judgments revealed fraudulent transfers where deceased owners' land was improperly registered without satisfying statutory succession requirements. In Kisumu, a High Court ruling cancelled a title held by Hirani Kanji Kurji after finding it unlawfully transferred from the estate of the late James Romanus Dacha. Similar cases in Meru led to convictions for fraudulent registration. These illustrate how weak verification at registry level facilitates illegal transfers (Mwakilishi, 2025).

Case 3: Ruiru Title Cancellation (2025)

In Ruiru, the Ministry of Lands cancelled hundreds of titles processed despite unresolved succession disputes. Buyers had conducted due diligence but titles were invalidated due to restrictions requiring formal letters of administration. This demonstrates how outdated or unreconciled registry records can mislead buyers and cause prolonged legal and administrative challenges (Masion, 2025).

The Critical Role of Licensed Surveyors

Licensed surveyors are central to the integrity, efficiency, and legitimacy of land subdivision and title processing systems. In Kenya's land administration framework, subdivision is not simply a physical division of land—it is a legally regulated transformation of property rights that must align spatial data, statutory requirements, and registry documentation. Licensed surveyors operate at this intersection of law, geography, and governance. Their technical competence and professional accountability directly influence whether newly created land parcels are legally secure, economically viable, and socially uncontested.

Boundary Accuracy

Boundary accuracy is the foundational function of licensed surveyors. Subdivision involves transforming a parent parcel into smaller units with clearly defined limits. This process requires precise measurement using approved geodetic controls, coordinate systems, and modern surveying technologies such as Global Navigation Satellite Systems (GNSS), total stations, and geographic information systems (GIS). Surveyors establish or re-establish parcel boundaries on the ground, place beacons, and prepare mutation forms and survey plans that are subsequently authenticated and lodged with relevant authorities.

Accuracy is critical because cadastral errors can have far-reaching consequences. Minor measurement



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discrepancies may result in overlapping parcels, encroachments, boundary gaps, or misalignment with adjacent properties. These inaccuracies often become the basis of disputes, litigation, and administrative rectification procedures. By ensuring that each newly created parcel is correctly georeferenced within the national cadastral framework, licensed surveyors protect the spatial integrity of land records. Their work ensures that the physical reality on the ground corresponds with registry documentation, which is essential for secure ownership, land valuation, and transferability.

Compliance Assurance.

Subdivision is governed by multiple legal instruments, including land registration statutes, planning laws, and surveying regulations. Licensed surveyors ensure that proposed subdivision plans comply with these statutory requirements before submission for approval. This includes verifying adherence to minimum parcel sizes, zoning regulations, access road provisions, public utility reservations, riparian setbacks, and environmental considerations.

Compliance assurance extends beyond technical measurement. Surveyors must interpret approved development plans, confirm that subdivision proposals align with spatial planning frameworks, and ensure that technical drawings meet prescribed coordinate and formatting standards. They act as a first layer of regulatory screening, identifying

potential inconsistencies before applications reach county planning offices or land registries. This proactive verification reduces the likelihood of rejection, repeated corrections, and procedural delays, thereby improving administrative efficiency.

By ensuring statutory conformity at the technical preparation stage, licensed surveyors contribute to orderly urban and rural development. They help prevent irregular settlements, land fragmentation below legally permitted thresholds, and encroachment on public or environmentally sensitive areas. Their role therefore supports both legal compliance and sustainable land use planning.

Professional Accountability.

Licensed surveyors are subject to formal accreditation, regulatory oversight, and professional codes of conduct. Licensing frameworks establish minimum academic qualifications, supervised practical training, and ethical obligations. This professional accountability distinguishes licensed practitioners from informal or unqualified actors who may lack technical competence or regulatory awareness.

Because survey plans form the basis for title registration, any technical error or intentional misrepresentation can compromise legal ownership. Inaccurate surveys may lead to financial loss, invalid transactions, or prolonged disputes. Professional accountability mechanisms—such as disciplinary

procedures, liability standards, and continuing professional development requirements—create safeguards against malpractice. Surveyors are legally and ethically obligated to act impartially, maintain accurate records, and avoid conflicts of interest.

This accountability fosters trust within the land administration system. Landowners, financial institutions, investors, and public authorities rely on professionally certified survey plans as authoritative representations of spatial reality. The credibility of cadastral documentation—and by extension the reliability of property rights—depends significantly on the ethical conduct and technical integrity of licensed surveyors.

Conflict Mitigation and Dispute Resolution.

Boundary disputes are among the most common sources of land conflict. These disputes often arise from unclear demarcations, historical survey inaccuracies, informal subdivisions, or encroachments. Licensed surveyors play a critical role in preventing and resolving such conflicts. During subdivision, accurate demarcation reduces ambiguity and minimizes the risk of overlapping claims. When disputes arise, surveyors conduct re-surveys, interpret historical records, and provide expert technical reports.

Their findings frequently inform administrative reviews, mediation processes, and court proceedings. Because surveyors rely on standardized



Licensed surveyors are subject to formal accreditation, regulatory oversight, and professional codes of conduct. Licensing frameworks establish minimum academic qualifications, supervised practical training, and ethical obligations.



Kenya's land subdivision and title processing systems are critical to secure land tenure, economic development, and investment. While legislative frameworks and digital platforms provide a blueprint, administrative bottlenecks, digitization gaps, historical inconsistencies, and technical survey challenges persist

measurement techniques and cadastral principles, their technical evidence carries evidentiary weight. By objectively determining boundary positions and documenting encroachments, licensed surveyors contribute to fair and evidence-based resolution of disputes. In doing so, they reduce prolonged litigation, lower transaction costs, and promote social stability.

Backbone of Secure Land Tenure.

Secure land tenure depends on three core elements: clearly defined boundaries, legally valid documentation, and institutional credibility. Licensed surveyors contribute directly to all three. Through precise measurement, they ensure spatial certainty. Through compliance verification, they safeguard legal validity. Through professional accountability, they enhance institutional trust. Through conflict mitigation, they strengthen social legitimacy.

In effect, licensed surveyors serve as technical custodians of the cadastral system. Their work links physical land, statutory frameworks, and registry records into a coherent and reliable property rights system. Without accurate and professionally validated subdivision surveys, land titles risk becoming legally vulnerable, economically unstable, and socially contested. Strengthening the role, oversight, and capacity of licensed surveyors is therefore essential not only for efficient title processing but also for broader objectives of economic development, investment security, and sustainable land governance.

In this sense, surveyors' professional standards do more than ensure technical accuracy—they form the structural backbone of secure land tenure and credible land administration systems.

Policy Recommendations

Addressing administrative bottlenecks and systemic inefficiencies in Kenya's land subdivision and title processing framework requires coordinated structural, procedural, technological, and behavioral reforms. The following recommendations are elaborated in greater depth to reflect both institutional realities and implementation considerations.

First, procedures governing subdivision and documentation should be standardized through comprehensive national guidelines developed collaboratively between the national Ministry responsible for lands and county governments. Devolution has enhanced local autonomy in planning control; however, it has also produced procedural fragmentation. Counties often apply different documentary requirements, approval sequences, fee structures, and interpretation of planning standards. This lack of uniformity increases transaction costs, prolongs processing timelines, and creates uncertainty for investors and landowners operating across jurisdictions. Standardization should therefore include: (a) uniform subdivision application forms; (b) a nationally approved checklist of required technical documents; (c) clear statutory timelines for each stage of approval; and (d) harmonized fee schedules or transparent fee calculation frameworks. Importantly, standardization does not eliminate county authority but rather

establishes minimum procedural benchmarks while allowing contextual planning discretion. Clear service charters publicly displayed in registries and county offices would further reinforce procedural predictability and accountability.

Second, digitization efforts must move beyond partial automation toward full system integration. The introduction of digital land administration platforms represents a major reform, but digital transformation is not merely the conversion of paper processes into electronic format. Effective digitization requires interoperable databases linking survey records, cadastral maps, registry entries, planning approvals, valuation data, and payment systems. Currently, fragmentation between these databases often forces manual cross-verification, undermining efficiency gains. A fully integrated digital architecture should enable real-time validation of parcel data, automated flagging of inconsistencies, and transparent status tracking accessible to applicants and licensed professionals. However, technological infrastructure alone is insufficient. Successful digitization depends on sustained staff training, change management strategies, adequate ICT infrastructure in counties, data migration accuracy, cybersecurity safeguards, and user education. Without investment in institutional capacity, digital systems risk replicating existing inefficiencies in a new format. Therefore, reform must be accompanied by structured capacity-building programs, periodic system audits, and feedback mechanisms for users.

Third, approval workflows should be streamlined to eliminate redundant

and sequential authorization layers that do not materially add regulatory value. In many instances, subdivision applications pass through multiple desks for routine verification, each adding marginal oversight but significant delay. A re-engineered workflow model should identify which stages are legally mandatory and which are administrative conventions that can be consolidated. Introducing parallel rather than strictly sequential reviews—where planning, survey verification, and registry validation occur concurrently—could significantly shorten processing time. Additionally, a risk-based approval framework should be adopted. Routine, compliant, and low-risk subdivisions (for example, those consistent with approved development plans and free of disputes) should qualify for expedited processing under defined timelines. Complex cases involving boundary disputes, public land concerns, or environmental sensitivities would continue to receive detailed scrutiny. Automated digital tracking systems that record timestamps for

each stage of review would enhance transparency, discourage discretionary delays, and provide performance data for institutional monitoring.

Fourth, professional oversight and regulatory enforcement must be strengthened to improve submission quality and protect public interest. A significant portion of administrative delay stems from incomplete, technically deficient, or non-compliant applications prepared by unlicensed or inadequately trained practitioners. Strengthening oversight should therefore include rigorous enforcement of licensing requirements, public verification portals for licensed professionals, and consistent penalties for unauthorized practice. Regulatory bodies should also enhance continuing professional development requirements to ensure practitioners remain updated on legislative amendments, technological changes, and evolving planning standards. By improving the technical accuracy and legal compliance of submissions at the source, institutions

can reduce repetitive corrections, resubmissions, and disputes that burden administrative offices.

Fifth, public awareness and civic education initiatives are essential to address informational asymmetries within the land sector. Many landowners initiate subdivision processes without understanding statutory requirements, spatial planning constraints, taxation implications, or the importance of engaging licensed professionals. This knowledge gap contributes to informal transactions, boundary conflicts, and resistance to compliance with planning standards. Structured public awareness campaigns should therefore disseminate clear information on subdivision procedures, documentation requirements, estimated timelines, and legal consequences of non-compliance. Outreach strategies may include community forums, media campaigns, simplified procedural guides, and partnerships with professional associations. Improved public understanding enhances voluntary



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compliance, reduces dispute frequency, and strengthens trust in formal land administration systems.

Sixth, institutionalized inter-agency coordination mechanisms are necessary to overcome siloed operations within the land governance framework. Land administration intersects with planning departments, survey offices, land registries, environmental authorities, valuation units, and dispute resolution bodies. Weak coordination among these institutions contributes to duplication of verification, inconsistent record updates, and prolonged dispute resolution. Establishing structured coordination committees or task forces at national and county levels would facilitate information sharing, joint problem-solving, and harmonized decision-making. Regular inter-agency meetings, shared performance indicators, and integrated reporting systems would promote collective accountability. Furthermore, publishing periodic performance statistics—such as average processing times and backlog volumes—would enhance

transparency and incentivize efficiency improvements.

Collectively, these expanded reforms address both structural and operational dimensions of administrative bottlenecks. Standardization promotes procedural clarity; digitization enhances transparency and data integrity; workflow streamlining reduces unnecessary delays; strengthened professional oversight improves submission quality; public awareness increases compliance; and inter-agency coordination fosters institutional coherence. Implemented together, these measures would significantly improve efficiency, reduce disputes, restore public confidence in land governance, and support sustainable land development outcomes in Kenya. Kenya's land subdivision and title processing systems are critical to secure land tenure, economic development, and investment. While legislative frameworks and digital platforms provide a blueprint, administrative bottlenecks, digitization gaps, historical inconsistencies, and technical survey

challenges persist. Licensed surveyors are central to addressing these issues, ensuring accurate boundaries, compliance, and accountability. Policy reforms, streamlined processes, and better integration of digital systems are essential for improving efficiency, reducing disputes, and fostering confidence in land administration.

Conclusion.

Kenya's land subdivision and title processing systems are critical to secure land tenure, economic development, and investment. While legislative frameworks and digital platforms provide a blueprint, administrative bottlenecks, digitization gaps, historical inconsistencies, and technical survey challenges persist. Licensed surveyors are central to addressing these issues, ensuring accurate boundaries, compliance, and accountability. Policy reforms, streamlined processes, and better integration of digital systems are essential for improving efficiency, reducing disputes, and fostering confidence in land administration.

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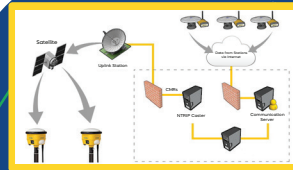
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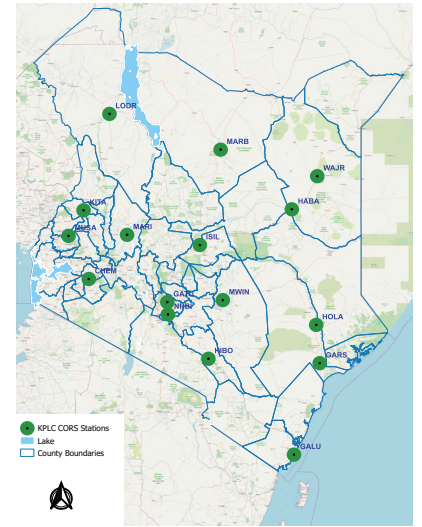


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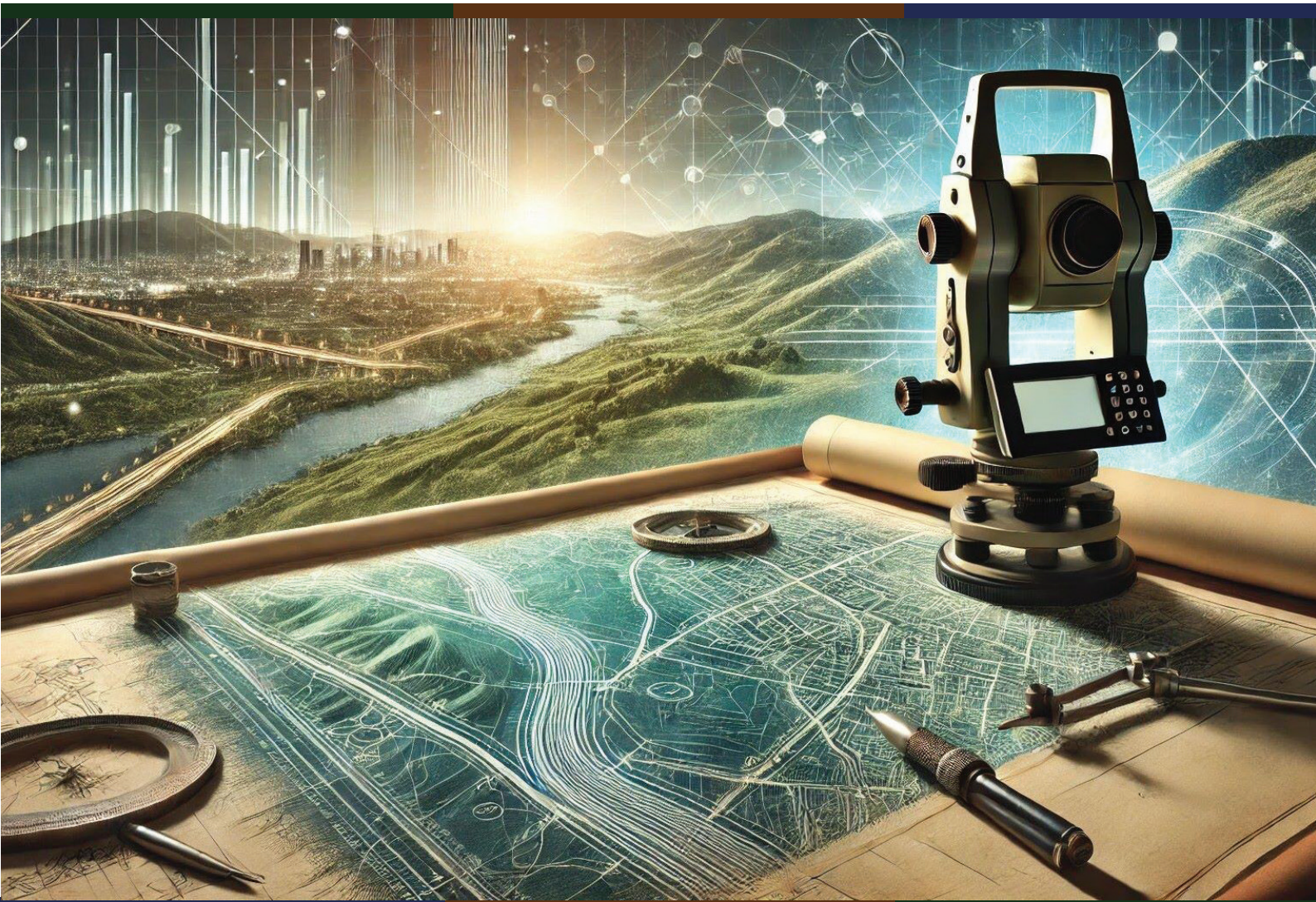
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