

The Conceptual Framework for Implementing eLAS Towards Sustainable Land Administration: Systematic Literature Review

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Key words: electronic Land Administration System (eLAS), Systematic Literature Review (SLR), conceptual framework, sustainable land administration, Sustainable Development Goals (SDGs)

SUMMARY

In the quest for more efficient, transparent, and equitable land management, electronic Land Administration Systems (eLAS) have emerged as a transformative tool, offering the potential to revolutionize traditional land governance processes. However, the successful implementation of eLAS extends beyond technological innovation; it requires a nuanced understanding of the socio-technical landscape and the ability to navigate complex challenges such as institutional readiness, governance frameworks, and stakeholder engagement. This study embarks on a Systematic Literature Review (SLR) in Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol to consolidate fragmented research on eLAS, with the aim of developing a robust conceptual framework that can guide its implementation towards sustainable land administration. By critically analyzing a diverse body of literature of academic articles, the study identifies key factors that influence the adoption and scalability of eLAS. The study delves into various dimensions, including technological infrastructure, legal frameworks, capacity building, and stakeholder engagement, to construct a comprehensive conceptual framework that guides the implementation of eLAS. This framework not only addresses the challenges associated with the digitalization of land administration but also ensures that the deployment of eLAS contributes to sustainable outcomes—such as improved land tenure security, enhanced service delivery, and reduced corruption align with global Sustainable Development Goals (SDGs). By integrating sustainability principles into the digital transformation of land administration, the study offers valuable insights for policymakers, practitioners, and researchers aiming to leverage eLAS for broader development goals. Ultimately, this research bridges the gap between theory and practice, providing a roadmap for the effective and sustainable implementation of eLAS, thus supporting the evolution of land administration systems towards greater equity, transparency, and efficiency.

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1. INTRODUCTION

The rapid digital transformation of global economies has profoundly impacted various sectors, including land administration, which is foundational to economic development, social equity, and environmental sustainability. Traditional land administration systems, often characterized by manual, paper-based processes, have struggled to keep pace with the growing complexity and demands of modern governance (Heriz, H., & Boubakeur, Y. 2022). These systems frequently suffer from inefficiencies, corruption, lack of transparency, and slow service delivery, contributing to land tenure insecurity and inequitable access to land resources (Adesola, B. A. 2024). The advent of electronic Land Administration Systems (eLAS) offers a significant opportunity to overcome these challenges by leveraging digital technologies to streamline processes, enhance data accuracy, and improve overall governance (Idris, K. A. 2024). However, the transition to eLAS is not merely a technical upgrade; it is a complex socio-technical endeavor that requires careful planning, integration, and management to ensure it supports sustainable land administration.

An eLAS is a digital platform that manages land-related data, records, and transactions. It facilitates the secure and efficient processing, storage, and retrieval of land information, supporting functions such as land registration, ownership transfers and cadastral mapping (Williamson, I. et al. 2010). Its a tool that can be used to enhances efficiency, transparency, and accessibility in land governance, reducing paperwork and minimizing the risk of errors or fraud. Implementing eLAS involves navigating a multitude of challenges that go beyond technological implementation. It requires rethinking and restructuring institutional frameworks, updating legal and policy environments, and ensuring that the necessary human and technical capacities are in place (Idris, K. A. 2024). Moreover, the success of eLAS depends on its ability to engage a broad range of stakeholders, including government agencies, private sector entities, civil society, and local communities. Without proper engagement and participation, there is a risk that the digital divide could widen, leaving vulnerable populations further marginalized (Ganason, A. 2022). Furthermore, the introduction of eLAS must be aligned with sustainability principles to ensure that it not only improves efficiency but also promotes transparency, equity, and long-term stewardship of land resources (Azadi, H. et al. 2023).

2. LAND ADMINISTRATION SYSTEM (LAS) FRAMEWORK

As reported by Chehrehbargh, F. J. et al. (2024), an efficient Land Administration System (LAS) plays a crucial role in achieving sustainable land administration by providing a structured framework for managing land resources effectively. eLAS are one of tools for advancing Land Administration Systems (LAS) by improving accessibility, efficiency, and

transparency. Although eLAS are powerful tools for advancing LAS for archiving sustainable land administration, the implementation of eLAS toward sustainable land administration faces several issues and challenges such as data quality and integration, legal and policy framework, technical challenges and interoperability (Idris, K. A. 2024). Addressing these issues and challenges by having a framework to implement an eLAS is crucial for achieving a sustainable land administration.

Table 1. Frameworks recognize eLAS as a tool for archiving sustainable land administration

Frameworks	Overview
Fit-for-Purpose Land Administration (FFP-LA).	This framework emphasizes the need for land administration systems to be adaptable, affordable, and scalable. It promotes the use of technology to ensure that land administration is efficient and meets the needs of various stakeholders while supporting sustainable land management practices (Bridging, L. A. 2023).
Integrated Geospatial Information Framework (IGIF).	Developed by the United Nations Committee of Experts on Global Geospatial Information Management (UNGIM), this framework provides guidance on integrating geospatial information into land administration systems, enhancing data accessibility and usability for sustainable development (Calzati, S., & van Loenen, B. 2023).
Land Governance Assessment Framework (LGAF).	While primarily an assessment tool, LGAF can guide the implementation of eLAS by identifying key governance issues and providing recommendations for integrating technology into land administration processes to enhance transparency and accountability (Mukhtarova, A. 2021).
Global Land Tool Network (GLTN).	This initiative promotes the use of innovative land tools, including eLAS, to improve land governance and administration. It focuses on developing tools that are inclusive and sustainable, ensuring that marginalized communities have access to land rights and information (Chigbu, U. E. & Antonio, D. 2020).
Digital Transformation Framework for Land Admin.	This framework outlines the steps and strategies for transitioning from traditional land administration systems to digital platforms, focusing on enhancing efficiency, accessibility, and sustainability in land management (Bennett, R. M. et al. 2024).
Open Data for Land Administration.	This framework promotes the use of open data principles in land administration, encouraging transparency and public access to land information through eLAS, which supports sustainable governance and community engagement (Okembo, C. et al. 2024)
Smart Land Administration (SLA).	This framework focuses on leveraging smart technologies, such as blockchain and artificial intelligence, in land administration systems to enhance efficiency, security, and sustainability in land management (Azadi, H. et. Al. 2023).

Table 1 above show several frameworks specifically noted on supporting the implementation of eLAS toward promoting sustainable land administration. These frameworks collectively support the implementation of eLAS that are efficient, transparent, and sustainable, ultimately

contributing to better land governance and management practices. By leveraging these frameworks, countries can enhance their land administration systems, ensuring they are efficient, transparent, and capable of addressing contemporary challenges related to land management and sustainability.

3. METHODOLOGY

Systematic literature review (SLR) method were used to identify relevant research articles that focus on “Electronic Land Administration System”. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol is used to identify, select, and critically appraise research to answer a formulated research question (Moher, D. et al. 2010). With PRISMA protocol, the author can evaluate the validity and quality of existing work against a criterion to reveal weaknesses, inconsistencies, and contradictions (Moher, D. et al. 2010). We can test a specific hypothesis and develop new theories by summarizing, analyzing, and synthesizing a group of related literature. Hence, the researchers conducted a SLR to get the splendid article to answer the question for the research (Moher, D. et al. 2010). The literature review follows 4 distinctive steps which are also closely related to the main features of the PRISMA statement (Moher, D. et al. 2010). The steps are as follows:

- Planning the review that includes identifying key research area, direction and requirement.
- Identifying the inclusion and exclusion criteria.
- Screening and reviewing the articles.
- Data synthesis by investigating, summarizing and visualizing the extracted data.

3.1 Planning the Review

The first step in conducting SLR is a review protocol establishment. The review protocol started with the main research questions to support the steps mentioned above. Scopus, Springer Link, World of Science (WoS) and IEEEXplore were used as the primary databases for keyword search as they are established, the largest globally used and well-known databases. Google Scholar is used as the secondary databases as its generality, open and free access database. Initially, “electronic land administration system” were used in the initial search and after the first round the adjustments were made in the search string. The search was not limited by the time frame, application areas, country or journal.

3.2 Study Specification

Inclusion and exclusion criteria are essential for an SLR. These criteria are needed to choose the most relevant papers for future analysis (Table 2). The present study is focused on digitalization by means of land administration system implied electronic system and, therefore, excluded articles containing various modernization or reformation of land administration system or land administration component or theoretical frameworks that are not supported or included by electronic system. Only journal and conference papers were included in the current SLR. Book chapters, notes, short surveys, letters, theses and editorials were not considered.

Table 2. Inclusion and exclusion criteria

Inclusion	Exclusion
Published in the year 2022 to 2024	Published before year 2022
English language	Other than English language
Journals & conference papers	Book, thesis, chapters, notes, letters, editorials, short surveys & proceeding
Contains data and information related to eLAS implementation (Method, Concept, Framework, Technology, etc.), issues, challenges and best practices.	Not containing data and information about eLAS implementation, theoretical without empirical data collection and only engineering aspects about eLAS. General literature review articles.

3.3 Data Selection

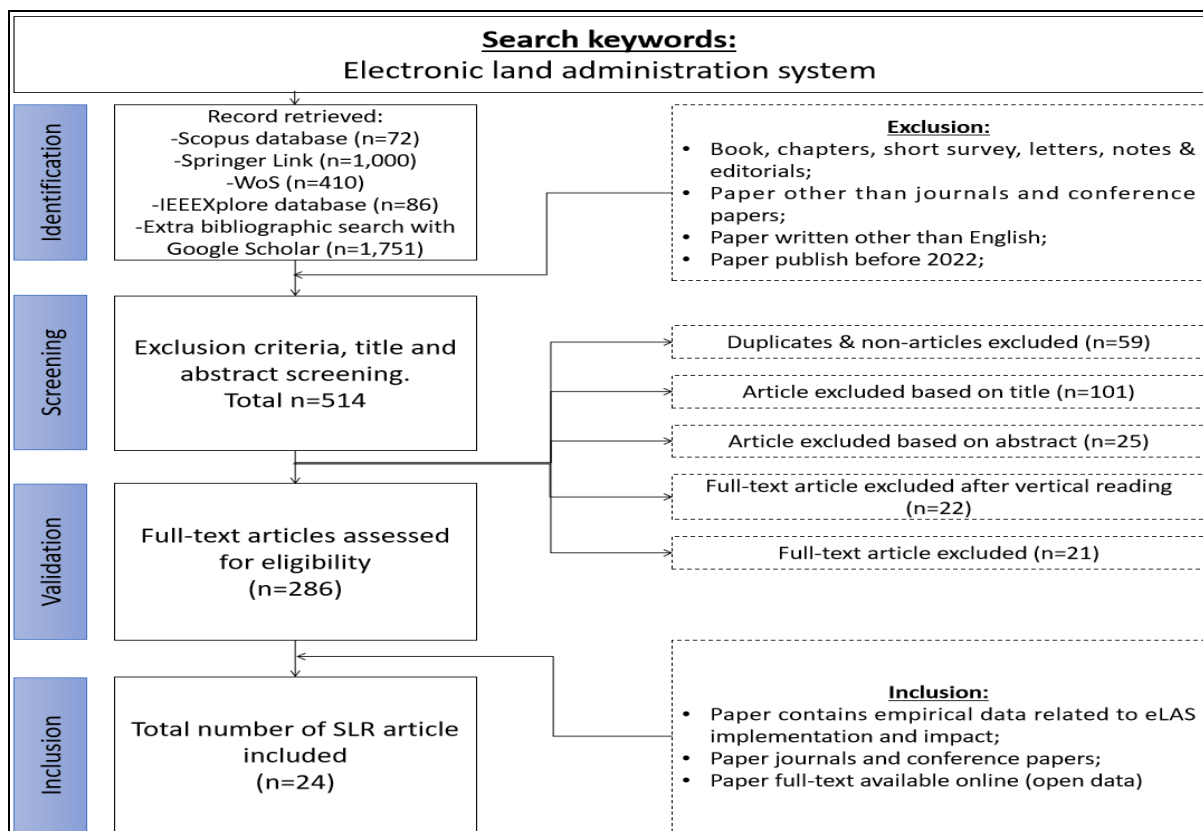


Figure 1. PRISMA protocol model used

The chosen keywords were transformed into a search string by adding Boolean operators such as “AND” and “OR”. From the initial search, 72 articles were retrieved from the Scopus database, 1,000 articles from the Springer Link database, 410 articles from the WoS database and 86 from the IEEEXplore. Through the additional Google Scholar keyword search and snowball search in citation chaining, further 1,751 papers were found. There were no restrictions on the timeframe, but the sustainable land administration agenda has caught scholars’ attention mostly from 2022 following The Sustainable Development Goals (SDGs)

adopted by the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development (UN, 2015). Therefore, selected articles were published from 2022 to 2024 (recent). After that, the inclusion and exclusion criteria (Table 2) were applied, leaving 514 articles for further duplicates and non-articles removal, also titles, abstracts, content and keywords analysis. 59 articles are excluded because of duplication & non-articles, mostly from the Google scholar search engine. After reading the titles and abstracts, 169 articles were eliminated for being out of the research scope. After the full-text assessments, 286 articles were found to be within the research scope. Most research has been excluded due to the fact that its focused predominantly on the theoretical framework, only land administration framework and engineering aspects, comparative analysis of the existing eLAS platforms or its technical architecture and a general literature review on eLAS. After screening the inclusion aspect of the articles, only 24 articles were suitable and selected to be reviewed. The detailed process is shown in Figure 1 above.

3.4 Profile of the Selected Articles

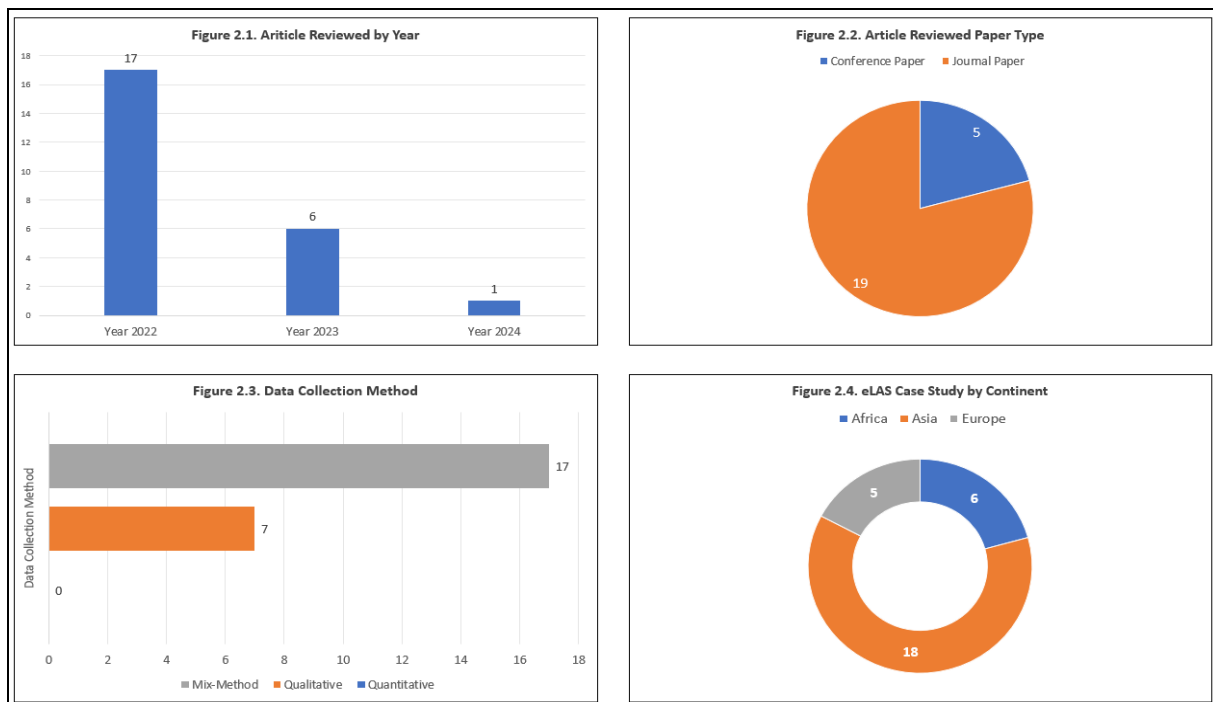


Figure 2. General Reviewed Article Profiling

The yearly publication analysis presented in figure 2.1 above reveals the growing academia's recent interest from 2022 and but the attention substantially decrease in 2023-2024. It is not a final explanation because 2024 is still 6 months away. Majority of the references (Figure 2.2) 79.17% a from journals and balance 20.83% is from conference papers. The methods of data collection in selected articles are interviews, case studies, observations, questionnaires and surveys. Majority are using Mix-Method data collection in 17 of article reviewed and balance 7, are using Qualitative Method in collecting data as figure 2.3. Highlighted also that Asia is the most continent research focus in eLAS (Figure 2.4) to illustrate the momentum of research

are globally expend world-wide and direction of research on implementing eLAS toward sustainable land administration to support SDGs can be adopted generally. Nevertheless, eLAS potential is still being scrutinized, and other research has confirmed the eLAS applicability in various land administration functions specially in land tenure, registration and land use planning and also can respond to SDGs demand.

4. DATA ANALYSIS AND FINDINGS

To get the real data to be reviewed, the thematic analysis method is used to analyses the data. This method is a suitable method to sort the qualitative data, which can really help us in the research. The themes were defined and grouped by the two independent authors by grouping the findings based on their similarity or relevance to ensure the reliability of the current work. Not only that, the article also will be analyzed based on the research question to get the theme of the research. The research questions, which are being referred to:

- What are issues and challenges arise when implementing eLAS? (RQ1)
- What is the framework used to implement eLAS? (RQ2)
- How will using framework to implement eLAS help? (RQ3)

4.1 Findings

A total of 24 articles were chosen for the systematic analysis after being screened using the eligibility requirements. This study used three research questions to guide its review of the selected articles. All the paper were summarizes and compares the papers that were chosen, which included the inclusion criterion of a systematic review of the literature, eLAS implementation issues and challenges, framework to implement eLAS with technology and good governance practices, positive or negative impact using framework to implement eLAS and how the impact connect to implement eLAS toward sustainable land administration principles and supporting SDGs global agenda.

4.1.1 Issues and Challenges Implementing eLAS:

All of the reviewed articles raise about data integration, sharing, quality and integrity as a challenge in implementing eLAS. Second most raise issues and challenges is incompatible policies and legal framework and regulatory barriers to implement eLAS optimally. The third most raise issues and challenges is part of governance challenges such as agencies collaboration, system interoperability, stakeholder engagement, public awareness, process bureaucracy and infrastructure limitation. Top three most discusses issues and challenges on implementing eLAS can be refer to table 3 below.

Table 3. Top three issues and challenges implementing eLAS

Issues & Challenges	Number of articles discuss	Percentage (%)
Data	24	100
Policies & Legal Framework	18	75
Governance	17	71

Data quality and integration is a challenge to implement integrated eLAS with other system to improve decision-making processes. For example, the transition from 2D to 3D LAS requires effective integration of existing datasets from various registers, which can be complex and challenging (Tomic, H. et al. 2022). There are also concerns regarding the accuracy and reliability of existing land data, which can hinder the effectiveness of eLAS (Recetin, I. et al. 2022). Data inconsistencies can undermine the trustworthiness of the data. The lack of a standardized methodology for updating and exchanging data contributes to these issues (Bobikova, D. et al. 2022). Most the policies & legislative framework issues discuss on harmonization of the legislation to electronic system, need for legislative amendment, regulatory compliance and legal and institutional barriers. These challenges arising from existing legal frameworks and institutional arrangements that may restrict data sharing practices (Hamamurad, Q. et al. 2022). In most country, they are separate stage of land law between federal, state, district and local government such as Malaysia with the National Land Code (NLC) of 1965 and various state laws contain clauses that may not align with the new electronic systems, creating legal and operational hurdles (Heriz, H., & Boubakeur, Y. 2022). Many of the governance issues and challenges arise about structural and organizational issues, inter-agencies collaboration, capacity limitations, bureaucracy, bribery and infrastructure limitation. The urban-rural dichotomy in land administration leads to bifurcated institutions for urban and rural lands, complicating the integration of eLAS across different governance levels (Azadi, H. et al. 2023).

4.1.2 A Framework to implement eLAS:

From this SLR study found that there is no formal specific framework to collaborate how to implement eLAS to archive sustainable land administration. Although there are establish framework for land administration system (LAS) that can be referred to table 1. There are also some eLAS implementation imitate this framework for guidance toward sustainable land administration. From this study, a concept of framework can be categories in two implementations of eLAS with technology-based and good governance-based. The concept of framework that found in this SLR study can be refer to table 4.

The choice of the best conceptual framework for implementing eLAS depends on various factors, including the specific needs, goals and context of the land administration project. The selection of the conceptual framework does not have to be of one type only, it can be combined in its implementation to get the best results based on the goals and projects. Like the study by Nwafor, I. V. et al. (2022), which combines a conceptual framework based on cadaster, LIS and GIS to examine the extent to which eLAS in Nigeria contributes towards the efficiency and effectiveness of service delivery, the challenges of its implementation and the factors considered to formulate improvements to the existing system.

Table 4. Conceptual Framework Implementing eLAS Categories

	Conceptual Framework	Brief Description	SLR Reference
Technol ogy	SDI-Based	Emphasizes the organization, access and sharing of spatial data. Focus on standards, interoperability and development of spatial data infrastructure (SDI) to support land	(Adesola, B. A. 2024), (Hamamurad, Q. H. et al. 2022)

	Conceptual Framework	Brief Description	SLR Reference
		administration.	
	Land Information System (LIS)-Based	Focuses on the collection, storage, processing, and dissemination of land-related information. The concept hovers over data about land parcels, ownership, land use and other related information	(Nwafor, I. V. et al. 2022), (Akumuntu, A. 2022), (Ganason, A. 2022)
	GIS-Based	Uses spatial analysis and mapping tools to manage and analyze geographic data. Useful for integrating various layers of information related to land administration	(Rana, S. K. et al. 2022), (Nwafor, I. V. et al. 2022), (Tomic, H. et al. 2022)
	Blockchain-Based	Exploring the use of blockchain technology to secure and manage land-related transactions. Provide transparency and variability of land records	(Alam, K. M. et al. 2022), (Christine, H. et al. 2022)
	Web-based & Mobile	Emphasizes the development of mobile and web applications for user-friendly access to land information. Supports remote and remote access to land administration services	(Rana, S. K. et al. 2022), (Christine, H. et al. 2022), (Adesola, B. A. 2024), (Pilare, G. et al. 2022)
	Cloud-computing	Leveraging cloud-based infrastructure and services for storage, processing and access to land-related data. Offers scalability and accessibility advantages	(Tomic, H. et al. 2022), (Racatin, I. et al. 2022), (Akumuntu, A. 2022)
Governance	Cadaster-Based/ LADM	Focus around cadastral data, which includes information about land parcels, their boundaries and ownership rights. Usually used for registration and property management	(Rana, S. K. et al. 2022), (Nwafor, I. V. et al. 2022), (Adesola, B. A. 2024), (Abraham, A. G. 2023)
	Enterprise Design	Provides a comprehensive view of the organization, including its business processes, data, applications and technology. Ensure alignment between the land administration system and the overall organizational or business structure	(Racatin, I. et al. 2022), (Permadi, I. 2023), (Bieliatynskyi, A. et al. 2022), (Azadi, H. et al. 2023), (Heriz, H., & Boubakeur, Y. 2022)
	SOA	Service Oriented Architecture (SOA) is focuses on designing the land administration system as a set of interrelated services. Promote modularity, scalability and reusability of system components	(Akumuntu, A. 2022), (Ganason, A. 2022), (Azadi, H. et al. 2023), (Heriz, H., & Boubakeur, Y. 2022)
	Land Governance-Based	Combining legal, institutional and organizational aspects of land administration. Dealing with issues related to land	(Racatin, I. et al. 2022), (Akumuntu, A. 2022), (Permadi, I. 2023),

	Conceptual Framework	Brief Description	SLR Reference
		ownership, land rights and land use planning	(Ganason, A. 2022)
	Risk Management-Based	Focusing on identifying and mitigating risks associated with the implementation of the land administration system. Address issues related to data security, system reliability and legal compliance	(Adesola, B. A. 2024), (Sahni, U. et al. 2022), (Heriz, H., & Boubakeur, Y. 2022)

4.1.3 Expected Impact Toward Sustainable Land Administration Using Conceptual Framework Implementing eLAS:

From the literature review, it was found that all the conceptual frameworks have good characteristics in their application based on the purpose of their use. Implementing an eLAS using a structured framework can have several significant impacts, both positive and negative. Figure 3 below show some of the key impacts.

Positive Impacts	Negative Impacts
<ul style="list-style-type: none"> • Improved Efficiency: A well-defined framework can streamline land administration processes, reducing the time and resources required for tasks such as land registration, transfer, and management. This leads to faster service delivery for users (Tomic, H. et al. 2022). • Enhanced Transparency: Implementing eLAS within a framework promotes transparency in land transactions and administration. Clear procedures and accessible information help reduce corruption and increase public trust in the system (Alam, K. M. et al. 2022). • Better Data Management: A structured framework facilitates the organization and management of land-related data. This includes the integration of various data sources, leading to more accurate and reliable information for decision-making (Ganason, A. 2022). • Stakeholder Engagement: A framework encourages the involvement of various stakeholders, including government agencies, local communities, and private sector actors. This collaborative approach ensures that the system meets the needs of all parties and fosters a sense of ownership (Sahni, U. et al. 2022). • Capacity Building: Implementing eLAS within a framework often includes training and capacity-building initiatives for personnel involved in land administration. This enhances the skills and knowledge necessary for effective system operation (Permadi, I. 2023). • Adaptability and Scalability: A structured framework allows for the adaptation of the eLAS to local contexts and the scalability of the system to accommodate future growth and changes in land administration needs (Christine, H. et al. 2022). 	<ul style="list-style-type: none"> • Implementation Challenges: Establishing a framework can be complex and may face resistance from stakeholders who are accustomed to traditional land administration methods. This can lead to delays and complications during the transition (Bieliatynskyl, A. et al. 2022). • Resource Intensity: Developing and implementing a comprehensive framework for eLAS may require significant financial and human resources, which can be a barrier for some regions, especially those with limited budgets (Nyangweso, D. O. & Gede, M. 2022). • Technological Dependence: Relying heavily on technology can create vulnerabilities, particularly in regions with limited infrastructure or technical expertise. System failures or cyber threats can disrupt land administration processes (Bieliatynskyl, A. et al. 2022). • Data Privacy Concerns: The collection and management of land-related data raise concerns about privacy and data security. A framework must address these issues to protect sensitive information from unauthorized access (Yadav, A. S. et al. 2022). • Potential for Inequity: If not carefully designed, the implementation of eLAS may exacerbate existing inequalities in land access and ownership, particularly if certain groups are less able to engage with the technology (Akumuntu, A. 2022).

Figure 3. Key expected impacts on implementing conceptual framework

In summary, using a framework to implement eLAS can lead to significant improvements in efficiency, transparency, and stakeholder engagement, but it also presents challenges that need to be carefully managed to ensure successful outcomes.

5. CONCEPTUAL FRAMEWORK IMPLEMENTING eLAS TOWARD SUSTAINABLE LAND ADMINISTRATION

In general, a conceptual framework is a conceptual structure or model that provides a systematic way to understand and analyze a particular phenomenon. It is a set of guidelines, principles or assumptions that help to organize and structure information, ideas or concepts (Khalid, M. I. et al. 2022). In implementing eLAS, it will involve the development and use of a conceptual framework that provides a structured approach to design and implementation. Various conceptual frameworks can be used, and the choice depends on the needs, context and specific goals of the land administration system to ensure that eLAS can be optimized for use in achieving the specific goals that have been set. Figure 4 below show the drafted conceptual framework develop from the SLR study. This conceptual framework utilizes a four-dimensional framework for implementing the eLAS. This framework includes the following dimensions:

- **Technological Dimension:** Focuses on the technological infrastructure required for eLAS, including the integration of blockchain technology to enhance data security and transparency.
- **Organizational Dimension:** Addresses the organizational structures and processes necessary for effective implementation, including stakeholder engagement and management.
- **Legal and Regulatory Dimension:** Considers the legal frameworks and regulations that need to be established or modified to support the adoption of eLAS and blockchain technology.
- **Socio-Economic Dimension:** Examines the socio-economic factors that influence the acceptance and success of eLAS, including public awareness, education, and the economic implications for users and stakeholders.

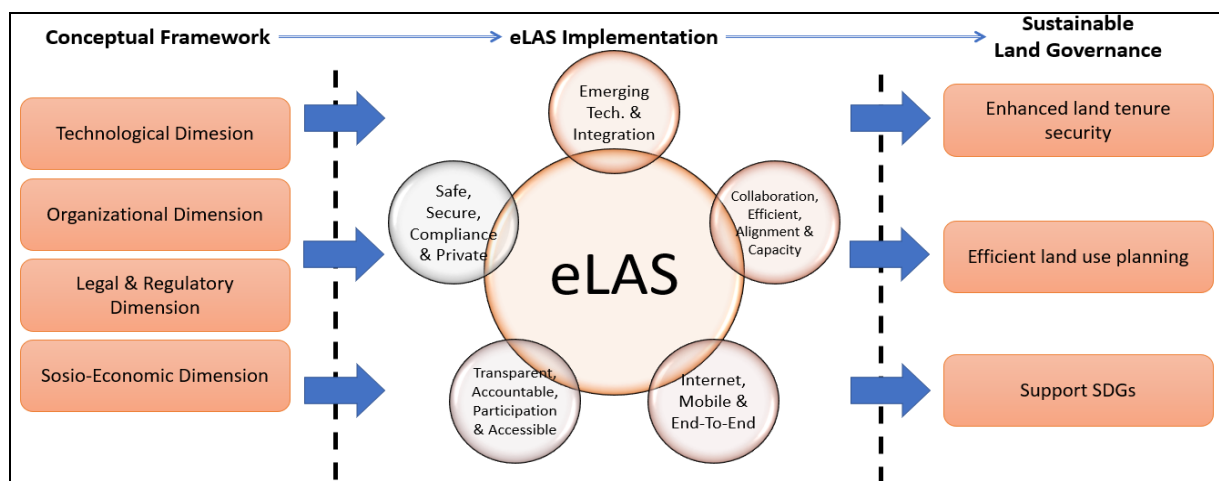


Figure 4. Drafted Conceptual Framework to Implementing eLAS Toward Sustainable Land Administration

Figure 4 above show the drafted conceptual framework. This comprehensive framework aims to ensure that all critical aspects of eLAS implementation are considered for successful

integration into land administration practices. By focusing on these components within the Four-Dimensional Dimension, the implementation of eLAS can be more effective, secure, and user-friendly, ultimately leading to better land administration outcomes. The eLAS can be more effectively integrated into existing organizational structures and practices, leading to improved land administration outcomes and greater stakeholder satisfaction. The eLAS also can be conducted in a manner that is legally sound, compliant with regulations, and capable of addressing the complexities of land administration in a digital context. Furthermore, it can contribute to more equitable land administration, promote sustainable development, and enhance the overall quality of life for communities. Figure 5 below show the element for every dimension in the conceptual framework drafted.

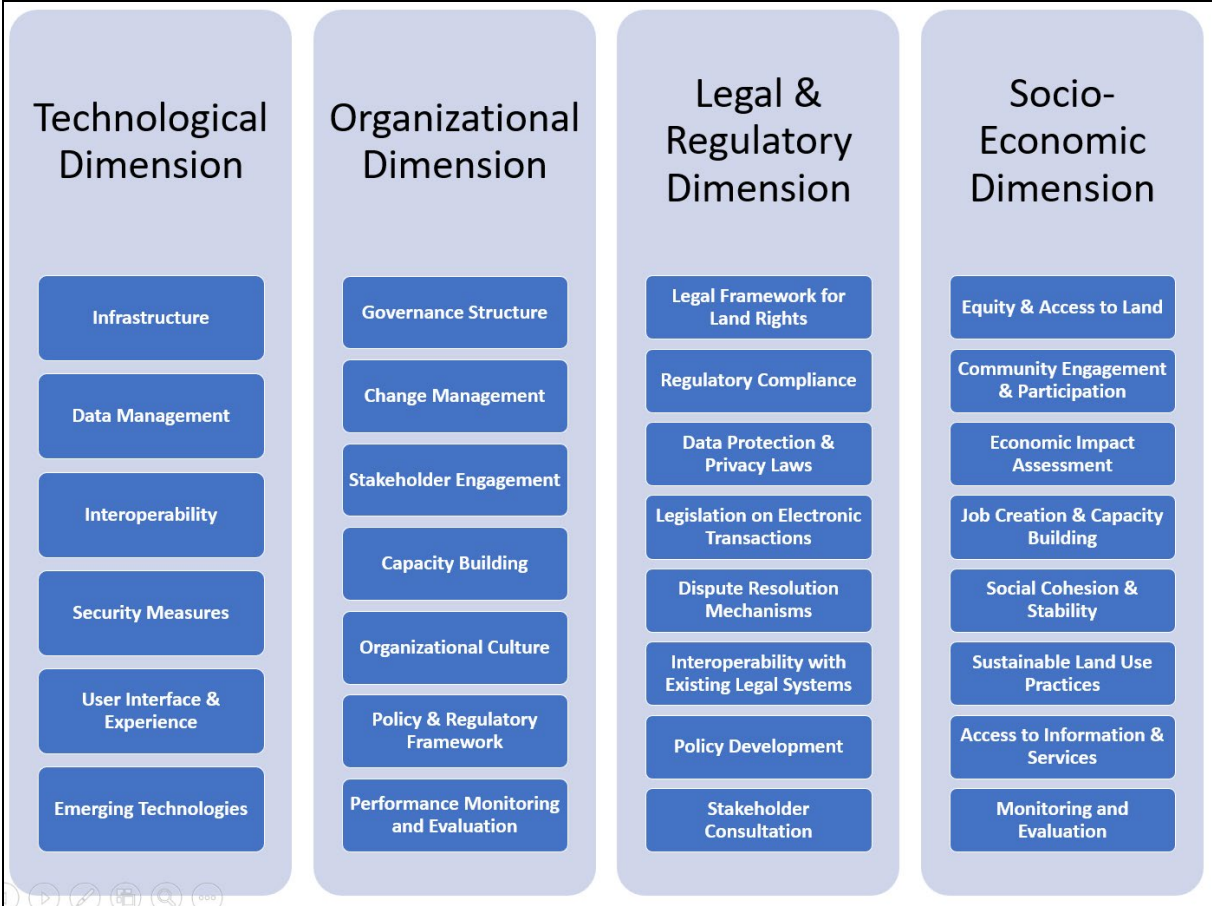


Figure 5. Elements for the four-dimensional dimension conceptual framework

6. CONCLUSION

In conclusion, this SLR study underscores the critical role of digitalization in achieving sustainable land administration. By meticulously applying the PRISMA protocol, the study identifies key challenges such as data integration, policy inconsistencies, and governance issues that hinder the effective deployment of eLAS. The exploration of a conceptual framework for implementing eLAS towards sustainable land administration presents a

compelling vision for the future of land governance. By addressing the multifaceted challenges of institutional readiness, stakeholder engagement and technological infrastructure, the framework not only paves the way for innovative solutions but also ensures that marginalized communities are included in the digital transformation journey. This study serves as a vital roadmap for policymakers and practitioners, emphasizing that the successful integration of eLAS is not merely a technological upgrade but a profound shift towards sustainable development that aligns with global aspirations for social equity and environmental stewardship.

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