Performance Evaluation of Land Administration Systems - Implications of Global Initiatives

Fatemeh JAHANI CHEHREHBARGH, Abbas RAJABIFARD, Behnam ATAZADEH, Australia and Daniel STEUDLER, Switzerland

SUMMARY

Managing the social, economic, and environmental aspects of land requires an effective Land Administration System (LAS). A LAS provides social justice, stability, and resilience by documenting and securing the human-land relationship. LAS provides critical information about land ownership, land use, and other important factors that can be used in disaster risk reduction. In order to improve their efficiency, LASs need to be evaluated in terms of performance and effectiveness. A performance evaluation framework is used to assess the effectiveness of current activities and the entire LAS. It provides a structured approach to measure performance against established goals and objectives, identify areas of strengths and weaknesses, and make informed decisions on how to improve the LAS. International societies such as the United Nations, and the World Bank, and associations like the International Federation of Surveyors, have developed global strategies to improve land administration practices to better respond to the current global challenges by proposing new frameworks. Each jurisdiction has its own unique LAS that is tailored to the specific legal, cultural, and economic context of that jurisdiction. However, there are certain commonalities among LASs, such as the need for accurate land records, efficient land administration procedures, and effective land use planning. To evaluate their LAS based on their jurisdictional requirements, a country can use an international performance evaluation framework that takes into account the specific context of that jurisdiction. The framework provides a structured approach to evaluating the performance of the LAS in relation to the specific needs and challenges of the jurisdiction. This involves identifying key indicators of LAS performance. Performance evaluation will enable them to determine their strengths and weaknesses for developing a reform roadmap. There is a lack of an international performance evaluation framework based on the parameters provided in global initiatives. This paper discusses the performance evaluation of LAS and proposes an evaluation framework for different aspects of LASs through a literature review of existing evaluation frameworks. It also considers the implications of global initiatives on LASs. This study establishes a connection between the indicators used in the proposed evaluation framework and the required parameters proposed by recent global initiatives, which is significantly important for achieving an effective LAS.

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1. **INTRODUCTION**

Land is a critical aspect of a country's economy and stability, as life on earth cannot be sustained without it. It is important to take care of the land for the sake of both present and future generations [1]. Land Administration System (LAS) is the primary mechanism for administering and managing land sustainably. LAS involves identifying, recording, and sharing information about the ownership, value, and use of land as part of land management policies [1, 2]. It also establishes the infrastructure needed to maintain the relationship between land and society [3] and it ensures social justice and stability by documenting and securing the relationship between humankind and land through improved land records that restrict rights and responsibilities. Additionally, LAS is crucial for disaster management, resilience building, and achieving Sustainable Development Goals, but it requires appropriate systems to be in place for effective implementation[4]. The United Nations and organizations like the International Federation of Surveyors (FIG) have conducted studies to comprehend and explain LAS for many years [5]. LAS is facing challenges due to the rising demand for land information, the emergence of novel land-related products and interests, and the latest ICT-enabled systems that lack the flexibility to cater to complex commodities and new land interests, as well as fail to meet the growing demands of end-users[6].

Land Information is a core element for achieving sustainable development in any jurisdiction. The United Nations' Sustainable Development Goals (SDGs) provides a framework that is widely regarded as a major global accord that has been endorsed by the majority of UN members [7]. This framework outlines the need for new data acquisition and integration approaches, including supporting developing countries to strengthen the capacity of their national data systems to ensure access to high-quality, timely, reliable, and disaggregated data [8]. It is anchored by 17 SDGs, 169 targets, and 231 indicators as a global indicator framework for measuring and monitoring progress. This includes national land and geospatial information, and the application of these data to support and address the SDGs. The SDGs are further supported by other global initiatives [9] such as the New Urban Agenda (NUA)[10], the Voluntary Guidelines of Responsible Governance of Tenure (VGGTs)[11, 12], and the Framework for Effective Land Administration (FELA)[13]. The SDGs include five goals with a significant land component mentioned in the targets. According to Rajabifard [14], to support SDGs, countries require access to an effective, efficient, and modernized LAS based on a

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cadastre engine that contains geographically accurate land parcels and associated rights, restrictions, and responsibilities.

The challenges of population growth, disasters, and land resource scarcity are increasingly affecting society, making it important to reassess the effectiveness of LASs. LASs play a crucial role in society, but with global initiatives focused on sustainability and community resilience changing the ways land is managed, current LASs may not always be adequate to address these trends and issues. However, coordinating and developing reform projects in the land administration field is becoming increasingly challenging. Additionally, evaluating national LASs is also becoming more difficult[15]. To improve efficiency and performance, you must evaluate or measure a process or a system: ''you can't improve what you can't measure'' or ''if you cannot measure it, you cannot manage it''[16]. This reassessment is becoming more urgent as the international authorities and land professional communities have put significant efforts into improving the practices in land administration, by introducing a series of new frameworks and models, such as the UN 2030 Agenda for Sustainable Development, the Integrated Geospatial Information Framework (IGIF), Framework for Effective Land Administration (FELA), and the New Urban Agenda (NUA), which are all directly or indirectly affecting LASs. Therefore, there is a need to introduce an evaluation framework which is adjusted in line with global trends and advancements. There is limited literature on the evaluation of the LAS, also there is not any study on performing performance evaluation by considering the implications of the global initiative on LAS.

1.1 Review of Evaluation Frameworks for Land Administration

Evaluation frameworks are a critical tool for assessing and enhancing the effectiveness of LASs, providing a structured approach to identify strengths, weaknesses, and opportunities for improvement, and supporting evidence-based decision-making to achieve better land management outcomes. During the early 1960s, evaluation gained popularity in the United States, particularly for assessing the effectiveness of development aid projects [17]. This field of study is concerned with answering questions such as whether the correct actions are being taken if they are being executed correctly, and what can be learned from past experiences [18]. The significance of evaluation frameworks lies in their ability to systematically pinpoint and compare the fundamental aspects of LASs, as well as learn from effective approaches, especially as there is a growing necessity for proficient and efficient management of land information, underscoring the importance of having comprehensive evaluation frameworks that allow stakeholders to enhance the performance of LASs and adapt to the evolving needs of land administration [15]. This section provides a review of the evaluation frameworks proposed for assessing LASs.

In 2001, Williamson and Ting suggested a framework for redesigning land administration and cadastral systems [19]. Steudler et al used the framework's concept and developed a practical framework that evaluates LAS activities or outcomes at the policy, management, and operational level. Also, in his evaluation matrix, he considered external factors such as personnel and their training, capacity building, professional associations, and technical

developments, as well as review processes focusing on objectives and strategies, system performance, and customer satisfaction [15]. In 2003, The Cadastral Template Project, initiated by the United Nations' former Permanent Committee on GIS Infrastructure for Asia & the Pacific (PCGIAP) in partnership with FIG, utilized certain indicators from Steudler's evaluation framework. This project aimed to enhance understanding of the role of a cadastre in a state or national SDI and to facilitate comparison of best practices as a means of improving cadastres as a fundamental component of SDIs [20]. The web-based platform of the Cadastral template was launched in 2014 to reflect the increasing acknowledgement of the relationship between cadastre and the concept of spatially enabled society [21].

In 2005, Enemark presented the concept of the land management paradigm and described that land administration includes an extensive range of systems and processes to manage land tenure, use, valuation, and development. This paradigm is commonly used for describing different parts of LAS [22]. In 2010, I. P. Williamson et al published the "Land Administration for Sustainable Development" book which contains information about land management activities, 10 principles of Land Administration, LAS processes, and evaluation [2].

Another example of an evaluation framework is the Land Governance Assessment Framework (LGAF). It evaluates the legal framework, policies, and practices related to land governance and monitors improvement over time. This framework consists of five broad thematic areas that have been identified as key areas for land sector policy intervention [23].

In 2018, Dawidowicz et al. assessed the Polish cadastral system by utilizing the global cadastral model. The evaluation involved comparing 55 indicators across 12 groups to determine the similarity between the Polish and global cadastre systems [24]. However, this study did not incorporate the latest evaluation frameworks that outline trends in cadastral components. As the reform of the cadastral system is still ongoing, it is crucial to stay up to date with the latest initiatives, organizational reports, technological advancements, and trends.

Land Equity International conducted an analysis in 2020 on the significance of Land IT Systems. The study aimed to determine the factors that must be considered when evaluating investments in creating and implementing comprehensive IT systems for recording land rights and facilitating subsequent transactions related to those rights. The analysis highlighted various risks associated with investing in such systems, such as those related to policy and legal frameworks, technology, institutional reform, sustainability, and financial analysis. Consequently, comprehensive analytical frameworks systematically and comprehensively consider sustainability, operability, institutional, political, and risk dimensions [25].

Chekole et al. initiated a research project in 2020 to create a framework for assessing the efficacy of urban cadastral system policies in Ethiopia. The framework is built on best practices and their associated indicators. The authors proposed performance indicators for eight policy-related aspects of the cadastral system. They compiled these indicators and good practices by conducting desk reviews of seven relevant frameworks and models [5].

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In 2022, Nyangweso et al. conducted a study evaluating the performance of the internal processes of LASs (LASs) due to the limited literature available on the topic. The evaluation comprised of 14 questions serving as indicators in areas such as Innovations, Operations, Marketing, and Customer Satisfaction, all viewed through the lens of an Integrated Performance Management System (IPMS) [26].

These studies provide several indicators to evaluate LASs. Most of them are restricted to specific jurisdictions, unlike global studies. Some focus on only a few technical features of LASs. Therefore, the objective of this study is to develop an evaluation framework through a literature review of existing evaluation frameworks by investigating the implications of global initiatives on the LAS. This research is particularly relevant since it links indicators of existing evaluation frameworks to measure the required parameters for an efficient LAS which are introduced by the latest global initiatives.

2. METHODOLOGY

To identify an overall set of indicators for evaluating LASs (LAS), this study conducted a literature review method. A literature review is a systematic and rigorous approach to identifying, analysing, and synthesizing relevant literature on a specific topic. It involves a comprehensive search for relevant literature, followed by a critical evaluation of the literature, data extraction and synthesis, drawing conclusions and making recommendations based on the synthesized data. Figure 1 shows the approach taken in this study.
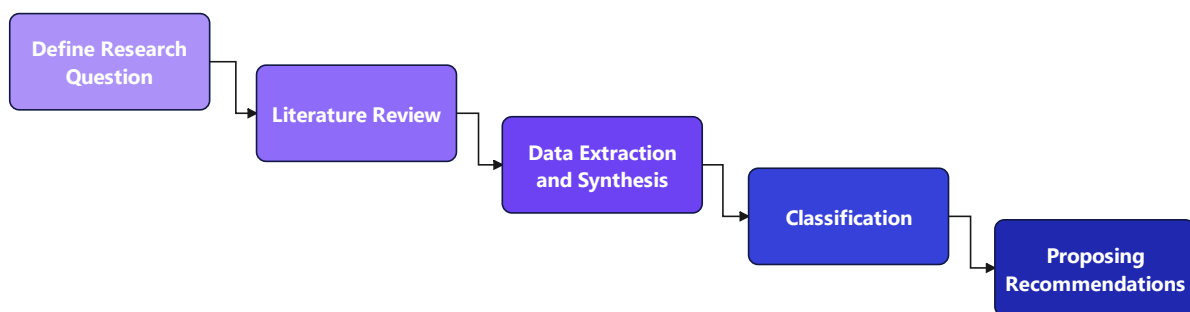

Figure 1. The flow of the used methodology in this study

1. Define Research Question: The research question for this study was formulated based on the identified research gap, which is the absence of a comprehensive set of indicators for assessing LASs, and it is stated as follows: "What are the key indicators for assessing LASs?"
2. Literature Review: A comprehensive search for relevant literature was conducted using academic databases, search engines, and reference lists of relevant articles. Relevant keywords, such as "evaluation", "Land Administration Systems" and "cadastre" were used to narrow down the search and ensure that the articles retrieved were aligned with the research question. The literature was screened and selected based on relevance, rigor, and quality and was chosen post-2015 to examine the impact of global initiatives, specifically the SDGs, on the evaluation frameworks. Despite its publication before 2015, Steudler's framework was considered one of the research-driven evaluations since

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it has been widely adopted by other researchers [15]. Papers that did not meet the inclusion criteria, such as those that were not relevant to the research question or those that were not based on rigorous research methodologies, were excluded.

3. Data Extraction and Synthesis: Relevant data were extracted from the selected articles, including the evaluation indicators proposed and the context in which they were proposed. The extracted data were synthesized by categorizing the evaluation indicators based on their relevance to specific aspects of LASs, such as land tenure, land use, and land registration.

4. Classification: The identified indicators were then organized into land management paradigms based on their relevance to specific aspects of LAS. The grouping was performed through a process of content analysis, where the indicators were assigned to the most appropriate category based on their thematic content. Once the indicators were categorized, a comprehensive set of indicators was developed by synthesizing and refining the indicators from the different categories. This was done through a consensus-based approach involving the research team, where the indicators were discussed, and the most relevant and appropriate indicators were selected for inclusion in the final set.

5. Proposing Recommendations: A series of recommendations were proposed based on the classifications of the indicators, identifying gaps in the existing literature by considering implications of global initiatives and providing guidance on the selection and use of evaluation indicators for LASs.

3. RESULTS AND DISCUSSION

By reviewing the latest global initiatives, a recent study [27] identified the areas related to land administration based on global trends (see Figure 2). To have an effective LAS, these areas and identified factors must be taken into account when designing a LAS, so they are considered the parameters required for advanced LASs. It is necessary to evaluate a system to improve it, and an evaluation framework comprises indicators that measure a system's performance according to its parameters. Drawing upon the factors and trends that were identified, and after conducting a thorough review of evaluation literature, we have put forth a collection of indicators that can be utilized to provide a comprehensive assessment of the performance of LASs.

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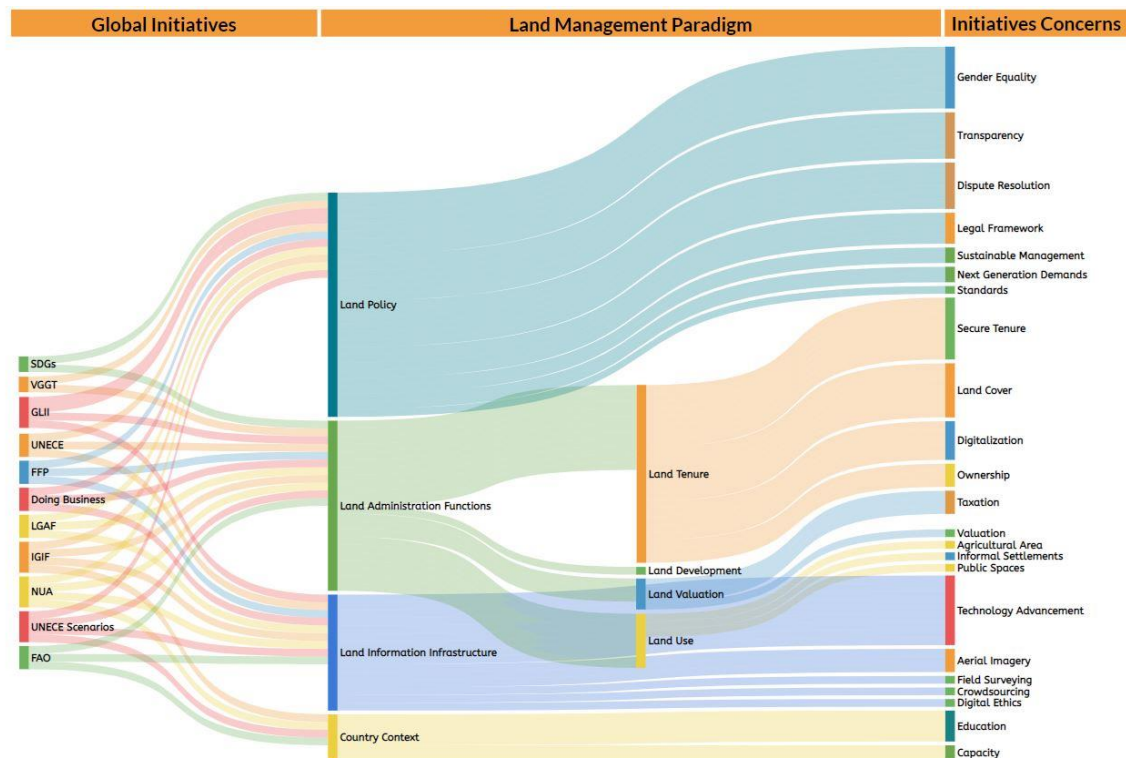Orlando, Florida, USA, 28 May–1 June 2023

Figure 2. The categorized factors of global initiatives according to the land management paradigm [27]

In order to take into account the implications of global initiatives, it is necessary to have a system that addresses the identified concerns of these initiatives. this study examined evaluation indicators and found that they are closely related to the concern factors of global initiatives, indicating that these indicators can effectively measure progress towards achieving an effective LAS by covering most of the essential factors.

3.1 Assessment of Land Policy

The land policy of the LAS must ensure fairness in gender, effective conflict management and dispute resolution mechanisms, and transparency. In order to evaluate the progress in achieving these essential parameters in a competent LAS, indicators must be established. Figure 3 identifies the relevant indicators based on evaluation frameworks reviewed in this research. This study recommends using alternative methods to determine indicators for the parameters not mentioned in the investigated frameworks. For instance, to assess gender equality in LAS, the Gender Legal Assessment Tool can be utilized to evaluate whether national legal and policy frameworks regarding land are supportive of gender equality. The identified indicators include the availability of cadastral and land administration principles, policy and legal frameworks for land sector reform, the political will to support the cadastral system, government policy for uniformity of cadastral system policy, legal provisions for cadastre, mechanisms for resolving disputes, policy development for participation in the cadastral system, cadastral system policy for cost recovery, strategic aspects and targets, land administration business processes, clear mandates for institutions regarding cadastre, and keeping the cadastre and land and mortgage

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register in the same organization. All these indicators must be met for a LAS to be considered efficient.
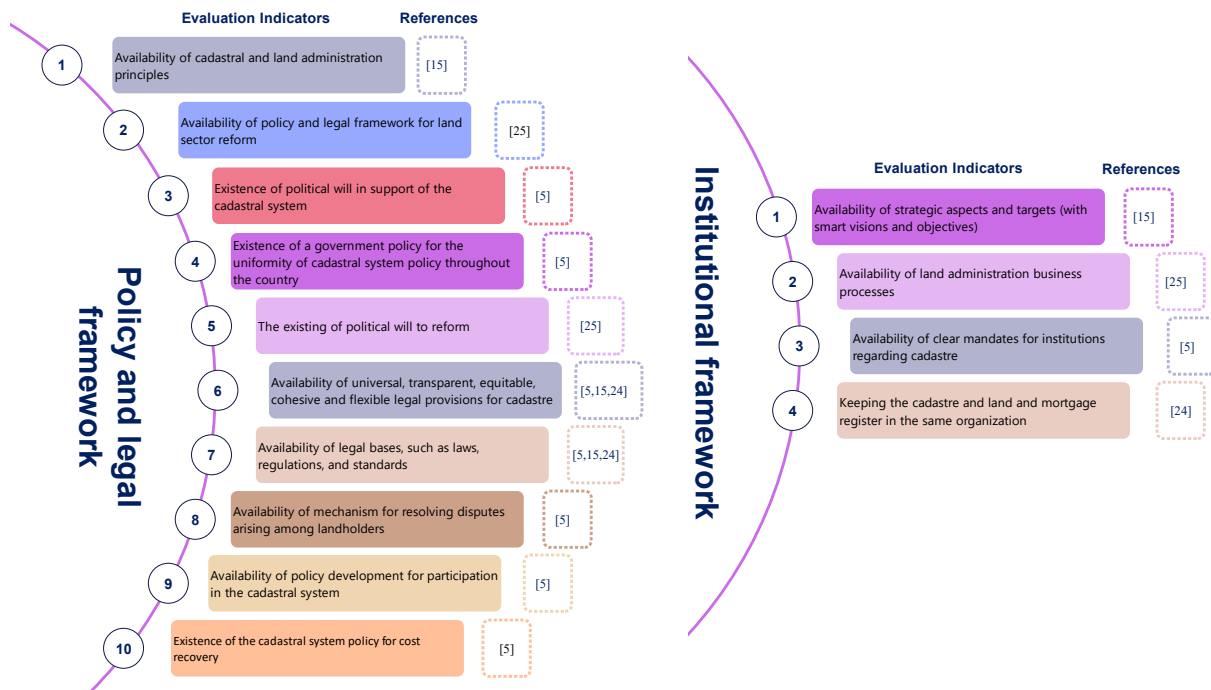

Figure 3. Indicators of evaluation framework in institutional and legal dimensions

3.2 Assessment of Land Administration Functions

Selected global initiatives prioritize land tenure as a major concern following land policy [27]. Within the land management paradigm, land tenure includes the allocation and protection of land rights, as well as determining land parcel boundaries through legal surveys, transferring title or use of land through sales or leases, and resolving disputes regarding property rights and boundaries [22]. Having secure land tenure is crucial for achieving sustainable development, enhancing resilience, and adapting to climate change. Furthermore, securing land tenure for women is essential for their social and economic well-being and to mitigate and adapt to sustainable climate change by reducing land degradation and increasing resilience to natural disasters [28]. Without a cadastral system, land tenure cannot be guaranteed.

The assessment of LA functions involves identifying key indicators that can be used to measure the performance of the system.

Table 1 provides a list of indicators that pertain to the technical aspects of LA functions. These indicators include the extent of geographic coverage of the LA system, modelling relations between objects, ensuring attributes of cadastral data such as reliability, accuracy, timeliness, flexible content, and completeness, object geometry and individual data layers, easy accessibility of data, numeric terrain models, unique identifiers for real estate objects in the database, the existence of the survey document containing cadastral measurements, and the availability of a multifunctional cadastral system that can calculate land and property tax. These

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indicators help ensure that the LA system has the necessary technical capabilities to ensure secure tenure and ownership, digitalization, and necessary attributes of data in the cadastral system.

Table 1. Indicators of evaluation framework in land administration functions

Indicators	References
1. High geographic coverage of the LAS	[25]
2. Existence of modelling relations between objects (terrain object – rights, restrictions, and responsibilities – claimant)	[24]
3. Ensuring attributes of cadastral data • Reliability • Accuracy • Timeliness • Flexible content (data content is adapted to the needs of cadastre users) • Completeness (scope of information provided by the system)	[24]
4. Existence of object geometry as an attribute	[24]
5. Existence of individual data layers	[24]
6. Easy access to data for all interested parties	[24]
7. Existence of numeric terrain models instead of charting	[24]
8. Unique identifiers in the database of real estate objects	[24]
9. Existence of the survey document containing cadastral measurements that constitutes a legal field source document	[24]
10. Ensuring data are collected only once and are kept at a level that guarantees the highest effectiveness	[24]
11. Existence of a multifunctional cadastral system that calculates land and property tax	[24]

3.3 Assessment of Land Information Infrastructure

For reliable and efficient land information infrastructure, it is crucial to have advanced and up-to-date technology that can support aerial imagery, field surveying, crowdsourcing data, and cybersecurity while adhering to digital ethics, including artificial intelligence and robot process automation, as highlighted in initiatives, making it a key factor for decision-makers to consider in achieving land administration reform [27]. As shown in Table 2, the indicators to assess the infrastructure of LAS cover the availability of a multifunctional cadastral system, spatial data infrastructure's features, appropriate infrastructure facilities, modern equipment and indoor analysis methods, protection of data against destruction or illegal alteration, and compliance with international standards.

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Table 2. Evaluation indicators of land information infrastructure

Indicators	References
1. Availability of a multifunctional cadastral system • registering all Rights, Restrictions and Responsibilities (RRR) associated with private and public property • reality modelling in any format (2d, 3d) • data models as part of data distribution practices • the same procedures apply to private and public property • an intuitive and secure system guarantees data validity and prevents data loss	[24]
2. Spatial data infrastructure (SDI) • Existence of digital technology for storing, inputting (electronic data transfer) and releasing data • Existence of automated data collection and update • Existence of software supporting the integration of graphic and descriptive data • Existence of visualizing option for any content in any format (2D,3D) • Integrating the land IT system into daily workflows	[24]
3. Using modern measuring methods (photogrammetry, GPS)	[24]
4. Existence of cadastral measurements with high-precision boundary surveys based on international precision standards	[24]
5. Existence of appropriate Infrastructure facilities (power, communication lines, internet connectivity)	[25]
6. Keeping cadastral databases on the same server	[24]
7. Creating backup copies of databases	[24]
8. Availability of website access via modern electronic communication channels	[24]
9. Using modern techniques for processing cadastral data	[24]
10. Existence of fast electronic processing of title documents and other documents	[24]
11. Existence of continuous data flow after the completion of automatic validation procedures	[24]
12. Using modern equipment and indoor analysis methods	[24]
13. Existence of data search, data integration, data comparison, identification of correlations between legally independent and legally organized, terrain objects, and the development of specific reports in the cadastral system	[24]
14. Existence of protection of data against destruction or illegal change	[24]
15. Ensuring cadastral resources are open to all interested parties	[24]
16. Availability of international standards such as LADM, technical standards	[5]

3.4 Assessment of Country Context

Capacity building is important because it ensures that the organizations responsible for land management have the necessary skills and knowledge to carry out their duties effectively. Without a trained and qualified workforce, LASs may be inefficient and ineffective, leading to poor land use practices, disputes, and environmental degradation. Sustainability is another critical factor because land management systems must be designed and implemented in a way that promotes sustainable land use practices and protects the environment. Sustainable land use practices are important for maintaining ecosystem services, conserving biodiversity, and promoting social and economic development. Finance is also a critical factor in land management because it is necessary to support the costs of land administration and to ensure the long-term sustainability of the system. Adequate funding is necessary to support ongoing operations, maintenance, and upgrades of LASs, as well as to support ongoing training and

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capacity-building efforts. Finally, performance assessment is important because it allows land management systems to be evaluated and improved over time. Performance assessment can help identify areas where the system is working well and where improvements are needed, and it can inform policy decisions and resource allocation.

Taken together, capacity building, sustainability, finance, and performance assessment are important components of the country context of land management because they are critical for ensuring the effectiveness, efficiency, and sustainability of LASs. Figure 4 presents indicators for the country context aspect of the LAS evaluation framework. These indicators are aimed at ensuring that the system has the necessary capabilities to support the effective and sustainable management of land-related resources.
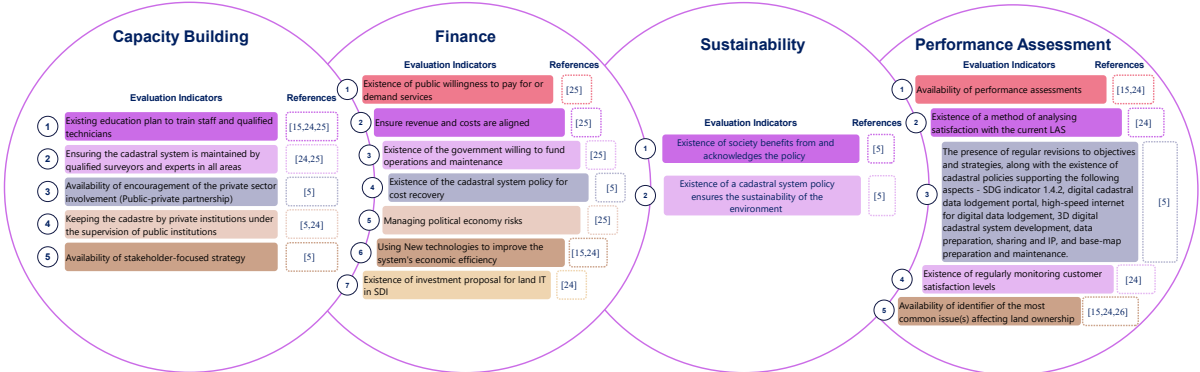

Figure 4. Evaluation indicators in the country context aspect of land management paradigm

The investigated evaluation frameworks have revealed some gaps in measuring certain aspects of LASs. This study proposes using introduced tools by global committees to measure the progress of the identified parameters that were previously lacking indicators. It is important to note that there is a mutual relationship between all parameters identified by [27] and their indicators, and the improvement of one parameter contributes to the improvement of the others.

4. CONCLUSION

Effective LASs are crucial for sustainable development in terms of social, economic and environmental aspects. However, despite the efforts of international initiatives and organizations, the lack of legally recognized land documentation in different countries shows that LASs still face inefficiencies. To improve LASs, a comprehensive evaluation framework that includes relevant indicators is necessary to assess the performance of LASs using land management paradigm components including land policy, land administration functions, land information infrastructure and country context. This study has proposed such an evaluation framework based on a literature review of existing frameworks and linked the extracted indicators to the land management paradigm. Decision-makers can utilize these indicators to evaluate the performance of LASs and ensure the development and implementation of effective systems that guarantee secure land tenure, ownership, and digitalization while promoting sustainable development, resilience, and adaptation to climate change. However, this study also

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acknowledges that the identified indicators do not encompass all aspects mentioned in global initiatives, and based on this limitation, future studies should explore additional indicators that can be incorporated into the performance assessment of LASs to ensure that they align with the broader global goals and priorities.

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BIOGRAPHICAL NOTES

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