

The Potential of the Land Administration Domain Model (Ladm) in Addressing Land Management Issues in Bangladesh

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Abstract: Land administration in Bangladesh is plagued by institutional fragmentation, corruption, outdated records, and mismanagement of public land, leading to tenure insecurity and protracted disputes. This study assesses the potential of the Land Administration Domain Model (LADM - ISO 19152), an international standard, to address these systemic challenges. Through a qualitative review of academic and grey literature, this article first delineates the core issues within Bangladesh's land sector. It then explores the structure of LADM, focusing on its core packages—Party, Rights-Restrictions-Responsibilities (RRR), and Spatial Unit—and its supporting features like VersionedObject and LA_Source. The analysis demonstrates that LADM's framework for interoperability, legal-spatial integration, and transaction traceability can directly respond to Bangladesh's key land administration problems. The study concludes that while LADM offers a robust technical blueprint for reform, its successful implementation necessitates strong political commitment, legislative harmonization, and comprehensive capacity building to transcend mere digitization and achieve genuine institutional transformation.

Keywords: Land Administration, LADM, Bangladesh, Land Management, Institutional Fragmentation, Digital Governance, Cadastre

Introduction

Sound land administration is foundational to effective land management, underpinning economic growth, social equity, and environmental sustainability. In many developing countries, however, dysfunctional land administration frameworks perpetuate poverty, inequality, and conflict. In Bangladesh, the land administration system faces constant challenges that compromise secure tenure, equitable access, and sustainable development. Institutional fragmentation, corruption, obsolete records, and a lack of inter-agency coordination have profoundly harmful effects on land governance initiatives. From tenure insecurity and land disputes to delays in mutation and acquisition processes, the challenges are deeply institutional. Land conflict alone gives rise to nearly 80% of rural court cases, a testament to the vastness of the problem (Raihan et al., 2020).

Efforts to digitize land services, such as the e-Mutation portal and Bhumi Sheba, have yielded only limited success due to the very fragmentation they aim to overcome (World

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Bank, 2022). Furthermore, public resources like khas land, intended for distribution to landless groups, have become arenas for elite capture and phantom awards (Sarker et al., 2021). These multifaceted challenges demand not only technological interventions but also robust institutional restructuring and a standardized approach to data and process integration.

This article provides an in-depth analysis of the Land Administration Domain Model (LADM), an international conceptual standard designed to facilitate the integration of land data, ensure transparency, and drive digital transformation. LADM provides a common ontology and conceptual model to standardize land administration systems, enabling institutional coordination, enhanced transparency, and the integration of administrative, legal, and spatial data.

Recent research in land administration emphasizes the importance of standardized conceptual models for integrating legal, spatial, and administrative land information. The Land Administration Domain Model (LADM), adopted as the international standard ISO 19152, provides a structured framework for representing relationships between land parcels, rights holders, and legal documents within land administration systems (Lemmen et al., 2015). Studies have shown that the Land Administration Domain Model (LADM) can contribute to improved interoperability between land information systems and transparency in land governance through standardization of property rights and spatial units (Lemmen et al., 2015). In addition, research into land governance reforms reveals that modern land administration systems must incorporate both institutional and technical aspects for effective land management. Although there is an emerging body of literature internationally on LADM, its potential role in resolving land administration issues in Bangladesh is not well explored. Therefore, this study aims to examine how the conceptual framework of LADM can help address structural issues in the land administration system in Bangladesh.

This study aims to explore the potential of LADM in resolving Bangladesh's systemic land management challenges. The specific objectives are:

1. To examine the key land administration issues in Bangladesh.
2. To explore the structure and function of LADM.
3. To assess whether LADM features can respond to the identified Bangladeshi issues.

Methodology

This study adopts a qualitative, literature-based methodology to evaluate the application of the Land Administration Domain Model (LADM) in the context of Bangladesh. The research relies on a systematic review of government reports and primary academic research. The primary sources utilized were peer-reviewed articles from journals such as *Land Use Policy* and the *Journal of South Asian Development*, alongside official reports from the World Bank, FAO, ISO, and Transparency International Bangladesh. The research focused on identifying applicable concepts, implementation experiences, and outcomes related to LADM and land administration reform. Search engines and databases

used include Google Scholar, Scopus, ScienceDirect, and institutional repositories. Key search terms included: "Land Administration Domain Model," "Bangladesh Land Administration," "Land Administration Issues Bangladesh," and "Land Corruption Bangladesh."

Selection criteria prioritized:

- Academic journal articles published after 2010.
- Research specifically encompassing essential conceptual literature and LADM applications.
- Studies addressing the challenges in land administration.
- Empirical case studies or technical articles with practical applications in the context of Bangladesh.
- Government and international reports related to land administration.

The review combined concepts from foundational land management literature with additional high-quality publications to ensure relevance. This triangulated approach ensured a clear understanding of both the structural challenges in Bangladesh's land sector and the technical applicability of LADM as a reformative tool. Additionally, AI Models (GPT, DeepSeek) have been utilized for basic research and formalizing text language.

Discussion

Land Administration Issues in Bangladesh

The land administration system in Bangladesh is a complex, multi-tiered structure involving the Ministry of Land at the apex, with district (zila), sub-district (upazila), and union-level offices handling day-to-day operations. While a Land Information System (LIS) has been piloted and digital initiatives like the e-Mutation portal and Bhumi Sheba exist, their impact remains limited. These systems often operate in isolation, digitizing existing fragmented processes without addressing the underlying lack of interoperability between agencies. The proposed LADM-based system is superior because it is not merely a digitization tool but a foundational standard designed to integrate all land-related data—legal, spatial, and administrative—into a single, coherent, and interoperable framework. This addresses the root cause of the current system's inefficiencies. The core issues are:

1. *Institutional Fragmentation and Coordination Failures:* The administrative structure is highly fragmented, with responsibilities divided among the Ministry of Land, the Ministry of Law, Justice and Parliamentary Affairs, and local government institutions (Raihan et al., 2020). This leads to delays, inconsistencies in updating records, and multiple records for the same plot (Transparency International Bangladesh, 2015). Proposals for unified digital records remain under-implemented due to institutional inertia (Chowdory, 2024).
2. *Corruption Networks and Patronage:* Corruption pervades all levels of land service provision. A 2015 survey found that 16.6% of households experienced corruption in land transactions, with bribe payments exceeding official land revenue (Transparency International Bangladesh, 2015). Political patronage influences recruitment and postings, reinforcing corrupt practices (Chowdory, 2024).

3. *Outdated and Inaccessible Records:* Land records are predominantly paper-based, maintained manually in under-resourced offices, which is fertile ground for errors and duplicity (Arifuzzaman and Islam, 2024). Digitalization efforts are incomplete and uneven, with over 40% of sub-districts failing to meet e-service benchmarks (Raihan et al., 2020).
4. *Complications in Land Acquisition:* Land acquisition under the 2017 Act is fraught with procedural delays, valuation disputes, and informal coercion. The process often benefits politically connected parties, while others face under-compensation (World Bank, 2022).
5. *Mismanagement of Khas Land:* Public land designated for the landless is frequently illegally occupied or improperly distributed. Despite over 10 million bigha of khas land, it is often unregistered or held by elites using fictional documents, with administrative bodies lacking the capacity for effective monitoring (Sarker et al., 2021).

Overview of the Land Administration Domain Model (LADM)

The Land Administration Domain Model (LADM), formalized as ISO 19152, is a conceptual model designed to facilitate the establishment and maintenance of land administration systems. It provides standardized terminology and a framework to describe land ownership, restrictions, spatial boundaries, and the parties involved in land transactions (Lemmen et al., 2015; Kalogianni et al., 2021). Its primary goal is to ensure interoperability, minimize institutional fragmentation, and support digitization. LADM is non-prescriptive and adaptable to various legal and technical environments, making it suitable for countries with formal and informal tenure systems. It is organized into three primary packages:

- **Party Package:** Captures individuals, groups, or institutions (e.g., landowners, tenants, government agencies) involved in land rights, ensuring accountability.
- **Rights, Restrictions, and Responsibilities (RRR) Package:** Represents legal relationships between parties and land, including ownership rights, restrictions, and responsibilities, linked to authoritative documents.
- **Spatial Unit Package:** Defines the land parcels, buildings, or volumetric units to which rights apply, supporting various geometric representations.

Supporting Classes and Features:

- **LA_Source:** All legal and spatial records in LADM must be tied to a source document. This ensures data provenance and enables an audit trail for changes over time. Sources are classified as either administrative (e.g., contracts, laws) or spatial (e.g., survey diagrams) (Lemmen et al., 2015).
- **VersionedObject:** Many classes in LADM (e.g., BAUnit, RRR, Party) inherit from VersionedObject, allowing systems to maintain historical records of all changes. This is essential for supporting dispute resolution, long-term tracking, and institutional transparency.
- **Unique Identifiers:** Each party, right, and parcel is assigned a unique ID, preventing duplication and enabling interoperability across agencies.

Moreover, LADM is extendable and compatible with other ISO and OGC standards, such as those for geographic information (ISO 19107) and cadastral surveying. It can be expanded with country-specific profiles and linked to domain-specific modules like: Social Tenure Domain Model (STDM) – for representing informal or customary tenure (Augustinus, 2010).

It is important to clarify that LADM is primarily a technical and conceptual standard, a structured ontology and metadata model, and not a direct instrument of political or institutional reform. In practice, LADM functions as an enabler by reducing technical barriers to interoperability (unique identifiers, LA_Source provenance, VersionedObject history), which can lower transaction costs and increase transparency. However, successful systemic change requires political will, legal harmonization, institutional mandates, and capacity building to use the standardized model. Thus, LADM is necessary but not sufficient: it facilitates and strengthens reform processes where enabling governance conditions exist, and is unlikely to produce institutional change where such conditions are absent. Recent studies have proposed structural improvements and extended capabilities for LADM Edition II, including enhanced support for 3D land administration (Kara et al., 2024).

Applicability of LADM in Bangladesh

Addressing Institutional Fragmentation: LADM offers an integrated model where each land parcel (LA_SpatialUnit) and its associated rights (LA_RRR) are connected to a single administrative unit (BAUnit). This integration enables easy interoperability across agencies. For example, when a deed is registered, its mutation and tax update would be automatically visible in other offices due to shared unique identifiers. Such implementation has improved inter-institutional coordination in countries like the Netherlands and Pakistan (Kalogianni et al., 2021).

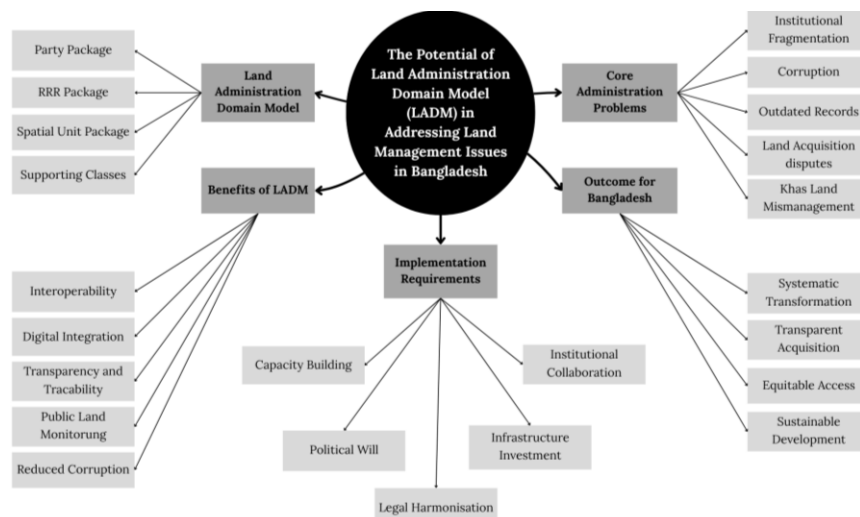


FIG 01: Potential of LADM in Bangladesh

Source: Authors, 2025

Combating Corruption with Traceability: LADM combats corruption through its inherent traceability. Each LA_RRR must be traced to a verifiable LA_Source (e.g., a deed or court order). Every transaction is recorded and linked to a responsible party (LA_Party), creating a clear chain of responsibility. The use of VersionedObject ensures this history is tamper-evident. Experience from Georgia shows how such transparency can suppress corruption (World Bank, 2022).

Modernizing Outdated and Inaccessible Records: LADM is inherently digital. It provides unique identifiers for all objects and supports both text-based and geometry-based spatial representations. By integrating legal (via LA_AdministrativeSource) and spatial (via LA_SpatialSource) records, Bangladesh can transition from disjointed paper files to an integrated digital land information system, enhancing accuracy and accessibility as seen in projects in India and Sri Lanka (Kalogianni et al., 2021).

Streamlining Land Acquisition: LADM enables transparent modeling of the acquisition process. State acquisition rights can be represented as special LA_RRR types, attached to specific BAUnits and linked to government institutions (Party). Notifications, court orders, and compensation agreements are recorded as LA_Source. This structured approach ensures all acquisition information is recorded, queried, and verifiable, leaving limited room for elite capture, as demonstrated in South Korea and India (Kalogianni et al., 2021).

Securing Khas Land Management: LADM provides tools to formally model khas land parcels as state-owned Spatial Units. Ownership rights (LA_RRR) are assigned to government agencies based on authoritative LA_Source documents. This enables the creation of a centralized, queryable database on khas land status and history. Illegitimate claims can be easily detected as they would lack the necessary source documentation, a method used successfully in Myanmar and India (Kalogianni et al., 2021).

Potential Outcome of LADM Implementation

Systemic Transformation: LADM brings together all actors, processes, and records into a shared framework, enabling institutional coordination and data consistency. The unification of cadastral records, legal rights, and administrative processes allows different agencies to interact with the same underlying land information without duplicating effort or creating conflicts. For Bangladesh, where multiple ministries and local offices operate in silos, this integration could reduce contradictions and delays while increasing overall efficiency and transparency.

Transcend Technology and Digitalization: Unlike conventional digitization efforts that merely transfer inefficient paper-based processes into digital systems, LADM reimagines the very structure of land administration. Its modular design—covering parties, rights, spatial units, and supporting documents—ensures that every transaction is traceable and legally anchored. By enabling version control and temporal tracking of land rights, LADM builds public trust in the integrity of the system, which is crucial for securing tenure and resolving disputes fairly.

Successful Use-Cases in Developed and Developing Countries: Countries like Georgia, Pakistan, and the Netherlands have successfully used LADM to overcome challenges similar to those in Bangladesh. Georgia's application of LADM-supported digital registries notably reduced corruption by making land transactions publicly visible. Pakistan integrated LADM with unique IDs and spatial cross-referencing, reducing forgeries and enhancing data reliability. In the Netherlands, fragmented registries were consolidated into an interoperable national system. These case studies provide not only technical proof-of-concept but also institutional strategies that Bangladesh could adopt, especially in managing khas land and land acquisition processes.

Table 1: Mapping Bangladesh Land Administration Challenges to LADM Features

Land Administration Issue in Bangladesh	Key Characteristics	Relevant LADM Component	Potential Contribution
<i>Fragmented institutional structure</i>	Multiple agencies maintain separate land records	Unique identifiers and BAUnit structure	Enables integration of records across agencies
<i>Corruption in land transactions</i>	Limited traceability of transactions	LA_Source and VersionedObject	Provides historical tracking of transactions
<i>Outdated and inconsistent land records</i>	Many records remain paper-based	SpatialUnit and administrative classes	Supports structured digitization of land records
<i>Limited interoperability between agencies</i>	Separate databases with incompatible formats	Standardized LADM schema	Facilitates data exchange between institutions

Source: Authors, 2025

Table 1 illustrates how key structural problems within Bangladesh's land administration system correspond to specific components of the LADM framework. By introducing standardized data structures and unique identifiers, LADM can facilitate interoperability between institutions responsible for land administration. In addition, the use of source documentation and versioning mechanisms can improve transparency and traceability in land transactions. While these technical features cannot eliminate governance challenges on their own, they can provide an important institutional foundation for improving land administration practices.

Limitation

This is primarily qualitative in nature and is more of a literature review. There is no new data collection in the field or empirical testing of LADM in Bangladesh. Therefore, it relies heavily on secondary data and comparative data from other countries. This limits our ability to argue causality with respect to how LADM would work in Bangladesh. The data and sources with respect to Bangladesh itself are limited in terms of coverage and quality. Often government and donor reports used in this analysis would be at the pilot stage of implementation (such as e-Mutation and Bhumi Sheba), where outcomes have not yet been

measured. There is no analysis of costs of implementation and no analysis of potential stakeholder motivations and likely political resistance. LADM is flexible and can be used in different contexts. However, it would be necessary to adapt it to local legislation and informal systems. These details of adaptation and implementation in Bangladesh are not discussed here. LADM provides a sound framework for thinking through how land administration data is structured and organized. However, current research suggests that it needs to be improved to accommodate more complex spatial relationships and modern digital cadastral systems. Research into LADM Edition II addresses these issues by proposing a new model and structure and better support for 3D spatial units (Kara et al., 2024). Therefore, it is essential to understand that our analysis is not proof that LADM will achieve particular outcomes in Bangladesh but is more of a reasoned evaluation of potential outcomes. Future work would be to conduct pilots of LADM in Bangladesh to assess its feasibility.

Conclusion

This study shows how the Land Administration Domain Model (LADM) is technically robust and flexible and can be used to address several structural issues in the land administration system of Bangladesh. This has been achieved by providing standardized classes (Party, RRR, SpatialUnit), unique identifiers, and provenance with LA_Source and VersionedObject. Comparative analysis of the use of LADM in the land administration systems of Georgia, Pakistan, and the Netherlands suggests that the use of LADM, in conjunction with country profiles and governance, has resulted in the enhancement of the land administration system in terms of improved interoperability and transparency. However, the success of LADM in improving the land administration system of Bangladesh would depend on the technical standardization of the land administration system, which, in turn, would be effective if accompanied by the harmonization of the Legislative framework, the political will of the government, and the capacity development of the stakeholders. Thus, LADM has to be integrated into the land administration system of Bangladesh as a high-value enabler in the context of the entire land administration reform process, and not as the solution on its own. The next steps in the use of LADM in the land administration system of Bangladesh would be to pilot the country profile, match the existing records with LA_Source, and then establish the governance structure for the exchange of data between agencies, which would translate the LADM into an implementation pathway.

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