

Cadastre, Legal Certainty, and Land Digitalization: A Comparative Study of Australia and Indonesia

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ARTICLE INFO	ABSTRACT
Keywords: Cadastral System; Land Registration; Legal Certainty; Digitalisation of Land Administration; Comparative Legal Studies; Torrens System. Date logs: Received: 01 June 2026 Reviewed: 1 July 2026 Accepted: 12 August 2026 Published: 2 Sept 2026 How To Cite: Haditama, I. (2026). Cadastre, Legal Certainty, and Land Digitalization: A Comparative Study of Australia and Indonesia. <i>Marcapada: Jurnal Kebijakan Pertanahan</i>, 6(1), 71-90. https://doi.org/10.31292/mj.v6i1.212	Cadastre and land registration systems constitute the foundation of legal certainty regarding land rights and are currently evolving in tandem with the digital transformation of land administration. This study aims to conduct a comparative analysis of the cadastral and land registration systems of South Australia and Indonesia, with a view to identifying best practices that may be adapted within the framework of national land administration reform. The research employs a normative legal research method, utilizing a comparative legal studies approach through the examination of statutory regulations, scholarly literature, and technical guidelines for cadastral surveying. The analysis focuses on regulatory structures, geodesy-cadastre integration, survey documentation, boundary dispute resolution, land registration systems, and land administration digitalization. The findings reveal that South Australia establishes legal certainty through the integration of a coordinated cadastre, positional uncertainty, rigorous survey documentation, the Torrens system, and electronic conveyancing. By contrast, Indonesia has made significant progress through GeoKKP, electronic certificates, and the One Map Policy, yet continues to face challenges pertaining to regulatory fragmentation, data interoperability, and spatial-juridical integration. This study offers a conceptual synthesis that interlinks the regulatory, cadastral, land registration, and digitalization dimensions as a foundation for strengthening an adaptive, accountable, and legally-certainty-oriented land administration reform.

A. Introduction

Cadastre and land registration systems are the primary foundations for achieving legal certainty over land rights, protection of civil rights, investment stability, and effectiveness in spatial governance and national development. In modern land administration practice, the cadastral system and the land registration system are two interrelated components that determine the evidentiary weight of land rights. The cadastre is no longer understood merely as a technical instrument for measuring and mapping land parcels but rather as an integral part of the legal system, public administration, and the national geospatial information infrastructure (Williamson et al., 2010). The quality of the cadastral and land registration systems significantly determines the state's capacity to guarantee legal certainty in land matters, reduce agrarian conflicts, and support sustainable economic development.

The digital transformation in global land administration has driven a paradigm shift from manual document-based land systems toward digitally integrated systems that are both spatially and juridically unified. Digital cadastre, electronic conveyancing, blockchain-based land registration, and spatial data interoperability have become essential components of land governance reform in various

countries (Bennett et al., 2011). In the modern land administration perspective, the integration of cadastre, land registration, spatial planning, and geospatial infrastructure constitutes a crucial prerequisite for achieving good land governance (Enemark et al., 2014). International organizations such as the International Federation of Surveyors (FIG, 2014) and the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) have also emphasized the importance of developing integrated, interoperable, and spatially data-driven land administration systems to support sustainable development and strengthen public governance.

In recent years, Indonesia has undertaken a digital transformation in land administration, marked by the implementation of the Geospasial Komputerisasi Kegiatan Pertanahan (GeoKKP) as a spatial-based land service application (Dirjen Survei dan Pemetaan Pertanahan dan Ruang, 2023; Pusdatin ATR/BPN, 2022); Electronic Certificates (Juknis No. 3/Juknis-HR.02/III, 2024; Permen ATR/Kepala BPN No. 1/2021); Electronic Mortgage Rights (Hak Tanggungan Elektronik–HT-el) (Ariefa, 2022); the One Map Policy (Kebijakan Satu Peta–KSP) (Mustofa & Wahyuni, 2020; Tim PKSP, 2016); and the strengthening of the 2013 Indonesian Geospatial Reference System (Sistem Referensi Geospasial Indonesia–SRGI) (Badan Informasi Geospasial, 2019). These various policies indicate a concerted effort toward more integrated and digitally based land management. Nevertheless, fundamental problems persist, including overlapping spatial data, regulatory fragmentation, weak inter-agency interoperability, inconsistencies in historical documentation, and suboptimal synchronization between physical and juridical land data. These conditions have direct implications for legal certainty over land rights and the effectiveness of land dispute resolution.

Numerous studies indicate that weak spatial-juridical integration is often a primary cause of legal uncertainty in land matters, boundary disputes, and protracted agrarian conflicts (Zevenbergen, 2002). Conversely, countries with integrated cadastral and land registration systems tend to have higher levels of legal certainty, more efficient public services, and lower risks of land disputes (Williamson et al., 2010). This suggests that land governance reform cannot be achieved through administrative digitization alone; it also requires the strengthening of integration between the legal system, survey documentation, geospatial infrastructure, and institutional governance.

Conceptually, the relationship between cadastre, law, and digitalization is both causal and mutually reinforcing. The cadastre provides spatial and juridical data on land rights objects. Digitalization enhances the quality, interoperability, and accessibility of such data, thereby reducing administrative errors and accelerating information updates. The integration of the two ultimately strengthens the rule of law through improved accuracy in land parcel identification, service transparency, consistency in rights registration, and effectiveness in dispute resolution. Thus, digitalization is not an end in itself, but rather an instrument for improving the quality of the cadastral system, which in turn supports legal certainty in land matters.

South Australia is a relevant jurisdiction for examination in this context. As a pioneer of the modern Torrens system, South Australia has developed a relatively integrated cadastral and land registration system through its coordinated cadastre, the application of Positional Uncertainty (PU), the Confused Boundary Areas (CBA) mechanism, and electronic conveyancing linked to a digital land registration system. This system is supported by a clear regulatory structure, rigorous survey documentation, and legal protections based on the principles of indefeasibility and indemnity (Edgeworth,

2017; Low, 2009; Whalan, 1975). South Australia's experience presents a compelling case for reflection in the context of Indonesia's land system reform, particularly regarding the strengthening of legal certainty and digital integration in land administration.

South Australia was selected as a comparative object because it is the jurisdiction of origin of the Torrens system, which to this day retains its core characteristics through the integration of cadastre, land registration, survey documentation, and digitalization of land services. In addition, South Australia has developed various institutional innovations, such as the coordinated cadastre, Positional Uncertainty, Confused Boundary Areas, and electronic conveyancing, all of which have been consistently implemented within a regulatory framework. These characteristics make South Australia a relevant benchmark jurisdiction for comparison with Indonesia, which is currently undergoing digitally based land administration reform.

Nevertheless, comparative legal analysis cannot be conducted mechanically through a simple approach of legal transplantation. Modern comparative legal studies emphasize the importance of social, historical, and institutional contexts in understanding differences between legal systems (Stephenson, 2025). Moreover, Indonesia's legal pluralism in agrarian matters, the existence of customary law (*hukum adat*), and the characteristics of its civil law system require that the adoption of foreign practices be carried out adaptively and contextually. Accordingly, comparative legal studies in the field of land governance are not aimed at directly copying the legal systems of other countries, but rather at identifying principles, institutional practices, and integration models that are relevant for the development of the national system.

Existing studies on cadastre and digital land administration in Indonesia have generally remained focused on technical aspects of measurement, implementation of electronic services, or partial examination of land dispute resolution. Research that integrates the perspectives of cadastre, legal certainty, land digitalization, and comparative legal studies within a single analytical framework remains relatively limited. Some studies have emphasized the information technology aspects of land administration, while others have focused on the normative aspects of land law without connecting them to the geospatial and cadastral administration dimensions. Based on the foregoing discussion, there is a research gap in the form of a lack of optimal studies analyzing the relationship between cadastre integration, land registration systems, survey documentation, and land digitalization from the perspective of comparative legal studies between Indonesia and jurisdictions that have mature digital land systems, such as South Australia (see Table 1).

Table 1. Research Gap Matrix

Researcher(s)	Main Focus	Research Gap
Williamson et al. (2010)	Framework for Sustainable Land Administration	Focuses on macro-conceptual frameworks; does not delve into the specific challenges of digital transformation in developing countries.
Bennett et al. (2011)	Digital Cadastre & the Future of Cadastre	Emphasizes technical aspects of digitalization; lacks exploration of the implications for material legal certainty within negative publication systems.
Zevenbergen (2002)	Land Registration Systems and	Discusses general comparisons of registration systems; does not compare the technical-cadastral dynamics between Australia and Indonesia.

	Their Legal Effects	
Indonesian Land Studies	Electronic Certificates & PTSL	Tends to be sectoral in nature; has not yet integrated cadastral geodesy functions, positional uncertainty, and land registration into a unified comparative legal synthesis.

(Source: Author's Synthesis, 2026)

The main problem addressed in this study is how the cadastral and land registration systems can be effectively integrated to support legal certainty in land matters amid the ongoing digital transformation of national land services. In this context, the primary research question to be answered is: what are the fundamental differences between the South Australian and Indonesian cadastral systems in terms of regulatory structure, technical-geodetic integration, legal certainty, and accountability? In addition, this study also seeks to identify policy lessons that Indonesia can draw from the Australian system, while remaining attentive to the characteristics of the national legal system and the context of Indonesian land administration.

To answer this question, this article maps the state of the art in contemporary comparative legal methodology, conducts a structured comparative analysis of various aspects of the South Australian and Indonesian cadastral systems, and highlights best practices that have the potential for adaptive adoption in Indonesia’s land administration reform. To provide a systematic overview of the logical flow and analytical workflow in this article, the research phase sequence is mapped as presented in Figure 1.

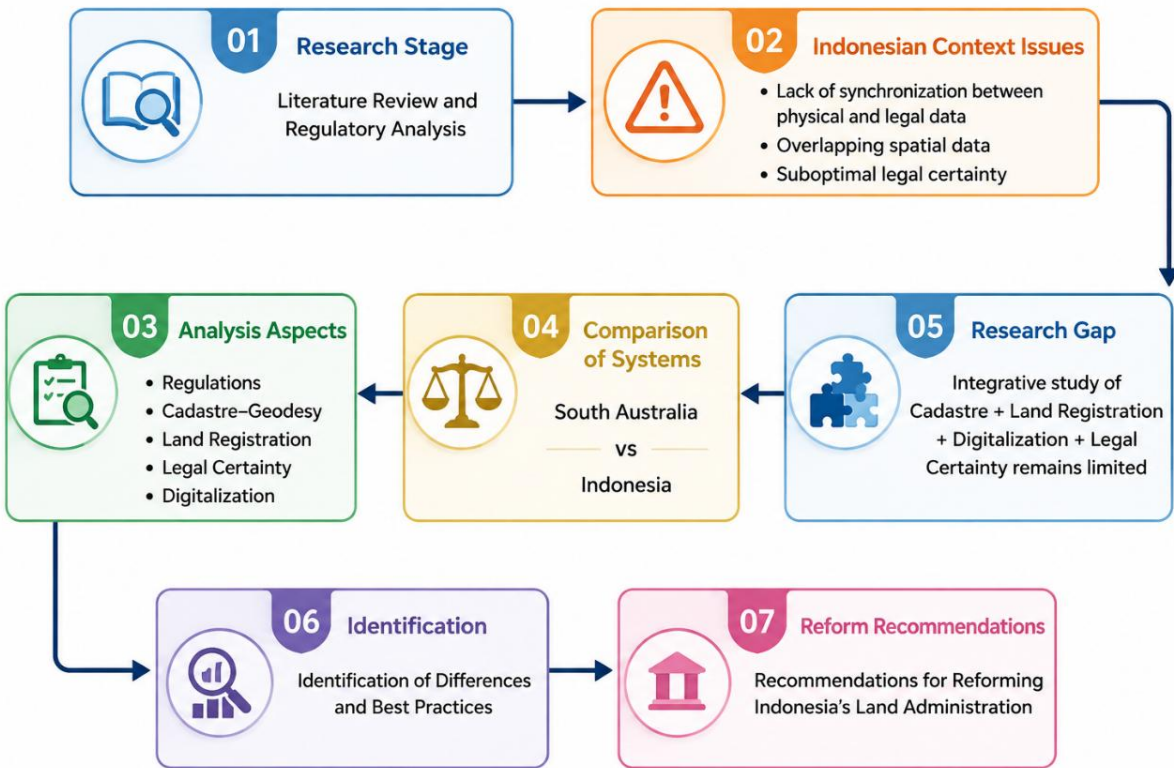


Figure 1. Research Stages
(Source: Author's Synthesis, 2026)

This study aims to analyze the comparison of the cadastral and land registration systems between South Australia and Indonesia in terms of regulatory structure, cadastral-geodetic

integration, survey documentation, boundary dispute resolution, legal certainty over land rights, and land digitalization. Furthermore, this study also aims to identify factors affecting the effectiveness of spatial-juridical integration in land management and to formulate conceptual reflections for strengthening digital land reform in Indonesia. The novelty of this research lies in its integration of analysis across the cadastral system, legal certainty in land matters, and digitalization of land services within a comparative legal studies perspective. Unlike previous studies that generally addressed technical or juridical aspects separately, this study connects the regulatory, geospatial, survey documentation, land registration, and digital transformation dimensions within a unified analytical framework to support national land governance reform.

B. Research Method

This study employs a normative legal research method with a comparative approach (*comparative legal studies*). This approach is used to compare the cadastral and land registration systems of South Australia and Indonesia in terms of regulation, institutional frameworks, survey techniques, geodetic-cadastral integration, boundary dispute resolution, and land registration systems.

The research approaches include: (1) a Statute Approach through an examination of the Survey Act 1992, the Survey Regulations 2020, the Real Property Act 1886 / Land Titles Act, Law No. 5 of 1960 (the Basic Agrarian Law / UUPA), Government Regulation No. 24 of 1997, Government Regulation No. 18 of 2021, and related technical regulations; (2) a Conceptual Approach through the concepts of the Coordinated Cadastre (CC), Positional Uncertainty (PU), the Torrens System, Indefeasibility, and Comparative Legal Methodology; and (3) a Comparative Approach to identify similarities, differences, and potential for adaptive adoption in the context of Indonesian land reform.

The sources of legal materials consist of: (1) *primary legal materials* in the form of legislation and official cadastral survey guidelines; (2) *secondary legal materials* in the form of scientific articles, books, and research findings related to land administration and comparative law; and (3) *supporting materials* in the form of policy documents on land digitalization and geospatial infrastructure. The analysis is conducted qualitatively and comparatively, with the differences between the *common law* and *civil law* legal traditions serving as the primary context for interpreting the comparative findings (see Figure 2).



Figure 2. Conceptual Framework of the Research (Source: Author's Synthesis, 2026)

C. Research Developments in Cadastre and Land Administration

1. Comparative Methodology

Before entering into the substantive comparison, it is important to acknowledge that comparative legal analysis is not a neutral or value-free activity. On the contrary, comparative methodology itself has been the subject of intense epistemological debate over the past two decades. Functionalism—the dominant approach that compares laws based on their same social function—has been extensively questioned by comparative law scholars. Modern comparative legal methodology can no longer rely solely on a functionalist approach; rather, it must consider the social, historical, and institutional contexts of the systems being compared (Stephenson, 2025). In the context of this study, this statement serves as a reminder that the comparison between the South Australian and Indonesian cadastral systems cannot be conducted mechanically or merely in search of "best practices," but must take into account the legal traditions, institutional structures, and social realities of each country. The dichotomy between positivist-functionalist models and postmodern approaches has created a methodological impasse. As an alternative, Stephenson proposes an approach based on a process-relational philosophy that synthesizes differences and similarities at an appropriate level of abstraction.

Furthermore, Haefke (2025) shifts the focus from "how to compare" to a more fundamental question: the motivation behind the comparison and the discursive context in which the comparison takes place. He emphasizes that the comparatist's positionality—background, interests, and objectives—significantly shapes the design and outcomes of comparative research. This caution is important given that the comparison between Australia and Indonesia in this article is not intended to justify the superiority of one system over the other, but rather to identify contextually relevant good practices.

Meanwhile, Pirie (2025) observes that the drive to expand the geographical scope of comparative law brings with it new challenges. Many expansion efforts remain confined to issues of the modern state and have not yet seriously considered non-state legal systems, religious traditions, or customary orders. In the Indonesian context, this serves as a reminder that the comparison with the South Australian system should not disregard the reality of legal pluralism that exists in society.

2. Cadastre 2014: Paradigm Shift in Cadastre

Over the past two decades, research developments in cadastre have shifted from a paradigm oriented toward the land registration function toward a broader approach as part of the land administration system, land governance, and geospatial information infrastructure. This shift indicates that the cadastre is no longer viewed merely as a technical instrument for measuring and mapping land parcels, but rather as an institutional infrastructure that supports legal certainty, economic development, protection of land rights, and the achievement of sustainable development goals (Enemark et al., 2014; Williamson et al., 2010).

An important milestone in the development of modern cadastral thought is the concept of *Cadastre 2014*, introduced by the International Federation of Surveyors (FIG). This concept transforms the cadastre paradigm from a land parcel recording system into a land information system integrated with legal, economic, environmental, and spatial planning aspects. *Cadastre 2014* asserts

that the boundary between cadastral maps and thematic maps will increasingly dissolve through the integration of spatial databases, while the role of government will shift from data producer to regulator and quality assurer of information. This concept later evolved into the foundation for the development of Spatial Data Infrastructure (SDI) and the Spatially Enabled Society, in which cadastral data becomes a primary element in geospatially based governance (FIG, 2014).

3. Fit-for-Purpose Land Administration

The next stage of development is marked by the emergence of the *Fit-for-Purpose Land Administration* (FFP-LA) concept, jointly developed by FIG and the World Bank. In contrast to conventional cadastral approaches that emphasize high geometric accuracy and costly processes, FFP-LA proposes a land administration system tailored to the actual needs of society. This approach is built upon three main pillars: the spatial framework, the legal framework, and the institutional framework. The system developed must be flexible, inclusive, affordable, incrementally implementable, and capable of providing legal certainty over land rights. This approach has become one of the dominant paradigms in land administration reform in various developing countries (Bennett et al., 2011, 2021).

4. Land Administration Domain Model

The subsequent development is the emergence of the *Land Administration Domain Model* (LADM), which was later adopted as the international standard ISO 19152. LADM provides a conceptual model that standardizes the structure of information regarding the relationships between parties (subject), spatial units (object), and rights, restrictions, and responsibilities. This standardization enables interoperability among land databases, strengthens cross-institutional integration, and supports the digital transformation of land administration. Various studies show that the implementation of LADM not only improves the quality of cadastral data management but also facilitates the development of digitally based land information systems and integration with other geospatial technologies (Lemmen et al., 2025).

5. Digital Cadastre

The next development is marked by the transformation toward a *Digital Cadastre*, namely the shift from an analog document-based cadastral system to an integrated digital database. Research by Bennett and colleagues shows that cadastral digitalization is not merely a conversion of maps into electronic format, but rather a comprehensive transformation of spatial data management, land registration, public services, and inter-agency interoperability. In this context, the quality of the digital database, update mechanisms, and the ability to maintain the history of land parcel changes become crucial factors in preserving legal certainty. The Digital Cadastral Database (DCDB) development model also enables gradual data quality improvement without the need to replace the entire existing system (van Oosterom et al., 2015).

6. Coordinated Cadastre

In line with digitalization, the concept of the *Coordinated Cadastre* (CC) has also developed—a cadastral system in which each land parcel boundary is defined based on geodetic coordinates connected to a national control network. In this system, coordinates function not merely as cartographic information but become an essential part of land administration that enables integration with the national geospatial information system. Nevertheless, various studies also affirm that

coordinates do not automatically serve as legal evidence of land boundaries. Boundary determination must still consider boundary monuments, historical evidence, and applicable land law principles. Thus, the CC represents a synthesis between spatial accuracy and legal certainty, rather than a replacement of either (Grant, 2006).

7. Spatially Enabled Land Administration

The most recent development leads toward the concept of *Spatially Enabled Land Administration* (SELA) or the *Spatially Enabled Society* (SES). In this paradigm, cadastral data is positioned as part of the national geospatial information ecosystem that supports cross-sectoral decision-making, such as spatial planning, taxation, natural resource management, disaster mitigation, and sustainable development. The integration of cadastre, land registration, SDI, and digital services enables the creation of a land administration system that not only provides legal certainty over land rights but also supports evidence-based governance. This paradigm places land administration as part of the national digital infrastructure that is interconnected with various other public services (Williamson et al., 2010).

8. State of the Art

The literature review reveals a consistent paradigmatic evolution, namely: *Cadastre 2014* → *Fit-for-Purpose Land Administration* → *Land Administration Domain Model* → *Digital Cadastre* → *Coordinated Cadastre* → *Spatially Enabled Land Administration*. Although each of these concepts has been extensively discussed individually, most studies remain focused on technical, institutional, or information technology aspects in isolation. Research on the conceptual relationship between cadastre integration, legal certainty, land administration digitalization, and land registration systems from the perspective of comparative legal studies, particularly through a comparison between South Australia and Indonesia, remains relatively limited. Therefore, this study seeks to fill this gap by integrating the regulatory, cadastral system, land registration, survey documentation, and digital transformation dimensions within a single comparative analytical framework.

D. Comparative Analysis of Cadastral Systems

1. Regulatory Structure and Hierarchy of Regulations

South Australia establishes its cadastral survey system upon a clear four-tier regulatory structure: (1) the *Survey Act 1992* (SA 1992) (Parliament of South Australia, 1992) as the primary legal foundation; (2) the *Survey Regulations 2020* (SR 2020) (Government of South Australia, 2020b) as implementing regulations; (3) *Notices of the Surveyor-General* (NSG) as technical directives; and (4) the *Cadastral Survey Guidelines* (CSG) (Government of South Australia, 2023) and (5) the *Plan Presentation Guidelines* (PPG) as operational guidelines (see Table 2).

Table 2. South Australian and Indonesian Cadastral Survey Regulations

South Australian Regulation	Equivalent Term in Indonesian	Remarks/Legal Basis in Indonesia
<i>Survey Act 1992</i>	UU Pertanahan (Pengukuran & Pemetaan)	Indonesia does not have a specific <i>Survey Act</i> . Technical provisions are contained within the UUPA (Law No. 5/1960) and its implementing regulations such as Government

<i>Survey Regulations 2020</i>	Peraturan Menteri ATR/Kepala BPN	Regulation No. 24/1997 in conjunction with Government Regulation No. 18/2021. Minister of ATR/Head of BPN Regulation No. 16 of 2021 concerning Amendments to Minister of Home Affairs/Head of BPN Regulation No. 3 of 1997 concerning Implementing Provisions of Government Regulation 24/1997.
<i>Notices of the Surveyor-General</i>	Surat Edaran/Petunjuk Teknis Dirjen	Technical instructions of Echelon I officials, such as the Technical Instructions of the Director General of SPPR No. 1/Juknis-300.UK.01.03/XII/2023 concerning Integrated PTSL Physical Data Collection.
<i>Cadastral Survey Guidelines & PPG</i>	Pedoman Teknis & Standar Format Peta	Technical appendices to Ministerial Regulations (e.g., Appendices for Measurement Drawings/Survey Letters) and BPN implementation technical handbooks.

(Source: Author's Synthesis, 2026)

The comparison in Table 2 shows that both South Australia and Indonesia have a regulatory hierarchy to govern cadastral surveys, but they apply different governance models. South Australia employs a simpler, more hierarchical, and integrated regulatory structure under the authority of the Surveyor-General as a *single technical authority*. In addition to the *Survey Act 1992* (SA 1992) and the *Survey Regulations 2020* (SR 2020), technical provisions are governed through the *National Cadastral Guidelines* (NCG), the *Cadastral Survey Guidelines* (CSG), and the *Practice and Procedure Guidelines* (PPG). The clear separation between legal norms, technical standards, and operational procedures enables standards to be updated quickly without amending the primary legislation, while remaining within a consistent legal framework that maintains legal certainty (Government of South Australia, 2020a, 2023; Parliament of South Australia, 1992).

By contrast, Indonesia regulates survey and land registration through multiple levels of regulation, ranging from the UUPA, Government Regulations, Minister of ATR/BPN Regulations, to technical instructions. This structure provides a comprehensive legal foundation but simultaneously increases the complexity of regulatory harmonization. Changes to technical standards often require adjustments across various regulations, resulting in slower update processes and potential inconsistencies, particularly in relation to national geospatial regulations and the One Map Policy (Mustofa & Wahyuni, 2020; Presiden Republik Indonesia, 2021).

This difference has implications for the effectiveness of land administration. The South Australian model demonstrates that a *single technical authority* can produce more consistent survey standards, accelerate technology adoption, and reduce normative conflicts. Conversely, Indonesia possesses stronger normative legitimacy but still faces challenges in the form of institutional fragmentation and cross-sectoral coordination (Bennett, Unger, Lemmen, & Dijkstra, 2021; Enemark et al., 2014). In the context of digital transformation, this condition affects spatial-judicial data interoperability, inter-agency synchronization, and the implementation of innovations such as CC, PU, and the integration of GeoKKP with the electronic land registration system. Therefore, the primary lesson from South Australia is not merely the simplification of the regulatory hierarchy, but rather the strengthening of governance capable of balancing technical flexibility, administrative accountability, and legal certainty through more effective regulatory coordination (see Table 3).

Table 3. Synthesis of Regulatory Implications

Aspect	South Australia	Indonesia	Implications
Regulatory Structure	Single technical authority (Surveyor-General)	Multi-regulation and multi-institution	Australia is more consistent in applying national technical standards.
Standards Updating	Through Notices and Guidelines	Generally through changes to Ministerial Regulations/Technical Instructions	Australia is more adaptive to developments in modern survey technology.
Technical Discretion	Explicitly regulated, published in the <i>Gazette</i>	Limited and administratively internal	Australia has technical flexibility that remains publicly accountable.
Oversight	Compliance audits & reporting to the Surveyors Board	Internal oversight by the Ministry of ATR/BPN	Australia has a transparent professional accountability mechanism.

(Source: Author's Synthesis, 2026)

The key difference lies in the formal grant of discretion to the Surveyor-General to issue directives and even exemptions from technical standards, provided that accuracy is not compromised and such decisions are publicly documented through the *Government Gazette*. In Indonesia, the approach is more normative-administrative, where the scope for discretion is limited and tends to be formalized through internal mechanisms.

2. Oversight Mechanisms for Surveyor-General Discretion

In South Australia, the authority of the Surveyor-General to issue technical directives and grant exemptions from survey standards is not absolute. Such discretion is constrained by the *Survey Act 1992* and the *Survey Regulations 2020*, so that every decision must remain within the bounds of statutory authority (*intra vires*) and must not compromise accuracy standards or the integrity of the cadastral system. Every Notice or policy with normative impact must be published in the *South Australian Government Gazette*. Furthermore, administrative decisions of the Surveyor-General are subject to judicial review if they exceed statutory authority. Oversight is also carried out by the Surveyors Board of South Australia, which has the authority to register, supervise, and enforce disciplinary measures against licensed surveyors.

In Indonesia, administrative discretion has a legal basis under Law No. 30 of 2014 concerning Government Administration (as amended by Law No. 6 of 2023). This law provides that discretion may only be exercised to facilitate the conduct of government, fill legal vacuums, provide legal certainty, or overcome governmental stagnation, while remaining bound by the General Principles of Good Governance (*Asas-Asas Umum Pemerintahan yang Baik*–AUPB). However, these provisions remain general in nature and do not specifically regulate technical discretion in cadastral surveys. Consequently, technical officials within ATR/BPN tend to adopt a formalistic approach, as deviations from standards may be perceived as administrative violations.

3. Geodetic Control Network and Cadastral-Geodetic Integration

South Australia has established a three-tier geodetic control network—Primary, Secondary, Tertiary—based on the *Geocentric Datum of Australia 2020* (GDA2020). This system requires every surveyor to submit coordinates for new Permanent Survey Marks (PSMs) and to explicitly report

Positional Uncertainty (PU) with strict tolerances: urban areas ≤ 0.049 meters, rural areas ≤ 0.099 meters.

Indonesia has a comparable foundation through the Geospatial Information Agency (*Badan Informasi Geospasial*–BIG) with the *Sistem Referensi Geospasial Indonesia 2013* (SRGI 2013), officially established on October 17, 2013. SRGI 2013 is a national unified reference system that is semi-dynamic, accommodating tectonic plate movements in the Indonesian archipelago, which lies within the Ring of Fire. The National Geodetic Control Network (*Jaring Kontrol Geodesi Nasional*–JKGN) established by BIG serves as the spatial infrastructure that serves as the reference for all thematic mapping, including land cadastre (Badan Informasi Geospasial (BIG), 2019; Badan Informasi Geospasial, 2014).

The Ministry of ATR/BPN has also been implementing the GeoKKP and Integrated Land Parcel Map programs as efforts toward realizing the CC principle. GeoKKP is a spatial-based land information system containing a unified map that meets BPN standards, produced through the digitization of analog maps and the integration of textual data from Survey Letters (*Surat Ukur*–SU) and Land Books (*Buku Tanah*–BT). The fundamental difference lies in the legal-formal aspect: Government Regulation 24/1997 nor Government Regulation 18/2021 explicitly mandate the inclusion of PU in public land registration documents such as certificates. Cadastral-geodetic integration remains a matter of technical policy rather than an explicit statutory mandate. Conversely, in South Australia, the obligation to report PU is regulated under national standards issued by the Intergovernmental Committee on Surveying and Mapping (ICSM), with PU targets for central business districts at 0.05 meters, urban areas at 0.2 meters, rural areas at 0.5 meters, and pastoral/remote areas at 5 meters. The ICSM (2023) explicitly states: "Improved spatial cadastres do not provide a legal position of the location of boundaries; they are still considered a graphical representation of the boundaries using the best available survey data and control."

This statement affirms that improvements in spatial cadastre quality—for example, through the use of high-precision coordinates, modern geodetic networks, and digital mapping technologies—do not automatically confer absolute legal force upon the position of land boundaries. Coordinates and cadastral maps remain regarded as the best graphical representation based on available survey data, rather than as the sole determinant of the juridical boundary location on the ground. In other words, the legal boundary of land must still be interpreted in conjunction with other evidence such as physical boundary monuments, historical possession records, legal documents, prior survey measurements, and applicable land law principles. Therefore, although modern cadastral systems can improve spatial accuracy and reduce the potential for disputes, legal certainty over land boundaries depends not solely on coordinate precision but also on the overall process of legal proof and land administration.

4. Survey Principles and Boundary Dispute Resolution

The Australian Guidelines comprehensively regulate the principles of *intention, lost and confused boundaries, occupation vs title, adverse possession*, and *encroachment*. The approach adopted is that of an *evidence-based adjudicative cadastre*, which prioritizes historical evidence, places physical monuments above numerical survey results, and recognizes physical possession under certain conditions (Government of South Australia, 2023).

As a *civil law* country, Indonesia does not treat jurisprudence as a primary source of law and does not recognize the concept of *adverse possession*. Land boundary determination relies on survey data, boundary setting (*contradictoire delimitatie*), and the Land Book. In PTSL practice, land parcel boundaries are determined based on *de facto* possession and agreement among neighboring parties (Rahmawati et al., 2022). Indonesia's approach is more socially flexible but has the potential to give rise to disputes if the initial agreement is not supported by strong historical documentation (Harsono, 2008).

Thus, the principal difference between the two systems lies in their approach to building legal certainty. South Australia emphasizes *ex-ante* certainty through robust survey standards, documentation, and spatial-juridical data integration to prevent disputes from the outset. In contrast, Indonesia places greater emphasis on *ex-post* certainty through evidentiary mechanisms when disputes arise. Therefore, land administration reform in Indonesia need not alter the character of the negative publication system, but should focus on strengthening the quality of cadastral data, survey documentation, and digital integration so that the system's flexibility is maintained without diminishing legal certainty over land rights.

5. Opportunities and Challenges for Implementing Confused Boundary Areas (CBA) in Indonesia

South Australia has a formal CBA mechanism to address historical inconsistencies in land boundaries. The determination of a CBA is conducted formally, participatively, and includes consultation and objection mechanisms. This approach is realistic because it acknowledges that not all boundary inconsistencies can be resolved based on historical documents that may have contained errors from the outset.

Indonesia faces similar problems in the form of overlapping parcels, discrepancies in old maps, and boundary shifts, but has not yet developed a legal instrument equivalent to the CBA. Resolution is still carried out through administrative mechanisms or mediation without a systematic framework. Yet, with more than 105 million registered land parcels as of 2023, a mechanism such as the CBA holds potential as a more structured and accountable solution. The opportunities for adaptation are also increasingly open through the implementation of PTSL, Complete Villages/Kelurahan (*Desa/Kelurahan Lengkap*), GeoKKP, SRGI 2013, and the One Map Policy, which have strengthened the spatial-juridical database, standardized coordinate systems, and improved geospatial information interoperability. This infrastructure can serve as the foundation for implementing CBA as a special procedure to resolve areas experiencing boundary discrepancies due to historical errors, changes in possession, or low-quality legacy data.

However, implementing CBA in Indonesia faces challenges different from those in South Australia. Legal pluralism in land affairs means that boundary determination depends not only on survey evidence but also on customary law (*hukum adat*), communal rights (*hak ulayat*), and community possession patterns that have not yet been fully documented. In addition, CBA implementation requires systematic re-surveying, the availability of competent cadastral surveyors, and adequate survey archive support. Other constraints include analog maps, coordinate system inconsistencies predating SRGI 2013, and the diverse quality of historical documentation, all of which hinder accurate boundary reconstruction. Therefore, CBA implementation should be conducted

gradually through pilot projects in areas with relatively good data quality, such as Complete Villages or validated PTSL locations.

The adaptation of CBA should also be understood as an *adaptive legal transplant* rather than a direct adoption from the South Australian Torrens system. The mechanism must be adjusted to Indonesia's negative publication system, the existence of communal rights, and the tradition of deliberation (*musyawarah*) in land dispute resolution. With such adjustments, CBA can evolve into an administrative mechanism that integrates juridical verification, cadastral surveying, community participation, and boundary mediation before disputes escalate to litigation, thereby improving the quality of spatial-juridical data while strengthening legal certainty over land rights.

6. Treatment of State Land and Land Rights

South Australia applies stricter survey standards to Crown Lands (State Land) and Crown Tenures (leasehold/concession rights over state land). The principle is that rights over state land must be clearly delineated before they are granted, and surveyors must ensure that no overlap occurs between private rights and state land.

In Indonesia, the equivalent is State Land (*Tanah Negara*) under the UUPA, with rights such as HGU, HGB, and HP further regulated under Government Regulation 18/2021. However, the main problem is that substantial areas of state land have not been precisely mapped, and overlaps persist between HGU and forest areas as regulated under Law No. 41/1999 concerning Forestry. Spatial data inconsistencies between the Ministry of ATR/BPN and the Ministry of Environment and Forestry remain a serious challenge, although the One Map Policy has sought to address them.

7. Documentation, Archiving, and Methodological Transparency

The Australian Guidelines emphasize that field notes are primary evidence, legal documents, and permanent archives. The principle that "if it is not recorded, it is deemed not to exist" is repeatedly affirmed. Every survey must produce a formal report containing the purpose, methods, accuracy achieved, field problems, and deviations from standards. This report becomes part of the official registration system and—with some exceptions—is publicly accessible.

Indonesia has similar documents such as Survey Minutes (*Berita Acara Pengukuran*), GU, and SU. However, not all reports explicitly contain deviation analysis, methodological transparency is limited, and public access to these documents is not yet fully open. Ongoing digitalization through the KKP application and the BHUMI platform is expected to address some of these challenges. Nevertheless, digital transformation still requires changes in work culture and stricter documentation standards.

8. Land Digitalization in Indonesia: Progress and Challenges

Indonesia has made significant strides in land digitalization in recent years. Since early 2025, the Ministry of ATR/BPN has implemented electronic-based services, ranging from Electronic Certificates (*Sertipikat-EI*) to electronic rights transfers. In 2025, the ministry succeeded in preventing potential state losses amounting to Rp9.67 trillion, including the safeguarding of approximately 13 thousand hectares of land. Ambitious targets have been set: by 2028, all land services will be digital, with the implementation of blockchain technology.

The BHUMI platform, launched as part of the digital transformation, presents a catalog of land data, spatial planning, and thematic information such as Land Value Zone maps, protected paddy field maps, and PTSL maps. The "*Sentuh Tanahku*" application enables the public to access land information participatively, assists surveyors in locating land parcels in the field, and allows tracking of application file status.

However, digitalization also presents new challenges. Research conducted by Andhika and Isa on the implementation of Electronic Certificates in Gorontalo City found that the policy remains constrained by technology infrastructure capacity, limited human resources, gaps in public digital literacy, and suboptimal land data synchronization (Andhika & Isa, 2025). The Deputy Minister of ATR/BPN acknowledged that approximately 70-80% of the ministry's tasks are directly related to public services, making system modernization crucial (Kementerian ATR/BPN, 2025).

Although land digitalization improves service efficiency and data integration, digital transformation also raises new issues concerning data security, validity of electronic documents, system interoperability, and protection of community rights in the digital space. Therefore, land digitalization cannot be understood merely as administrative modernization, but rather as a comprehensive transformation of land law governance.

9. Land Registration Systems: South Australian Torrens and Indonesian Negative Publication

South Australia is the pioneer of the Torrens system through the *Real Property Act 1886*, now updated by the *Land Titles Act 2021*. This system is built upon the principles of constitutive registration, protection of registered title holders (*indefeasibility of title*), state compensation guarantee (*indemnity principle*), the certificate as conclusive evidence, and digitalization through electronic conveyancing (Boast, 2015, 2017; Dickinson, 2017; Edgeworth, 2017; Garoupa & Arlota, 2016).

By contrast, Indonesia adheres to a negative publication system with a positive tendency, as regulated under Article 19 of the UUPA and Government Regulation No. 24 of 1997 (Soemardjono, 2009). In this system, registration is not fully constitutive, the certificate is strong but not conclusive evidence, challenges to certified land remain possible under certain conditions, compensation mechanisms are not comprehensively regulated, and digitalization through the Complete Systematic Land Registration (*Pendaftaran Tanah Sistematis Lengkap*–PTSL) and Electronic Certificates is still ongoing incrementally (Roestamy, Martin, Rusli, & Fulazzaky, 2022). These characteristics have implications for different levels of legal certainty (see Table 5).

In Indonesia, the non-final nature of the evidentiary weight of certificates contributes to the continued high number of land disputes, as reflected in the cases of Jatikarya, Sultan Hotel, Gambut, and Karuwisi, which lasted between 11 and 44 years (Simanjuntak, Uwiyono, & Padmadari, 2025). Conversely, South Australia achieves stronger legal certainty because it is supported by a constitutive registration system that provides greater protection to registered title holders. This comparison shows that South Australia's advantage lies not only in its cadastral system but also in its integrated land registration legal framework, making it an important reference for land administration policy development in Indonesia.

The technical cadastral differences between South Australia and Indonesia must be understood alongside the land registration system as the juridical instrument that determines the evidentiary

weight of certificates. The most fundamental difference lies in the application of the Torrens system in South Australia and the negative publication system with positive elements in Indonesia. Although the Torrens system offers high legal certainty through the principles of *indefeasibility* and *indemnity*, its application in Indonesia requires adaptation because it must take into account the social function of land, legal pluralism, and the existence of communal rights.

10. Systematic Comparison Summary

Based on the foregoing discussion, the following synthesis can be drawn: strengthening Indonesia's cadastral system requires closer integration between the technical survey aspects and the legal aspects. Although the UUPA and Government Regulation 18/2021 have provided a strong legal foundation for land registration administration, regulatory improvements are still needed to explicitly link survey results with the establishment and guarantee of land rights. Normative evaluation of these regulations and their derivative technical provisions should be directed toward more explicit regulation of CC, PU, and spatial-juridical data interoperability. In this context, the concept of CC as articulated by Grant affirms that all land parcel boundaries within a jurisdiction are legally defined through state-guaranteed coordinates, thereby providing both spatial certainty and legal certainty (Grant, 2006). In line with this, Indonesia also needs to adopt PU publication standards as applied by the ICSM, by establishing proportional accuracy thresholds based on regional characteristics. Information on PU should be included in cadastral map metadata and, with adequate explanation, should also form part of the public information on land certificates. This step is important given that low understanding of spatial uncertainty has the potential to give rise to boundary disputes as well as state legal liability in cadastral administration (Yildiz & Kocaman, 2022). The following is a synthesis of key differences in tabular form (see Table 4).

Table 4. Systematic Comparison Summary

Aspect	South Australia	Indonesia
Regulatory hierarchy structure	Clear 4-tier; formal and documented discretion	Tiered, complex, dispersed; more administrative discretion
Treatment of exemptions	Explicitly regulated, published, accuracy must not be compromised	Rarely formalized as exemptions
Positional Uncertainty (PU)	Mandatorily stated and controlled under national standards; explicit targets	Not explicit in certificates; no legal mandate yet
Cadastral-geodetic integration	Formally institutionalized through coordinated cadastre	Still partial; GeoKKP as technical policy
PSM public database	Structured, open, integrated	Not yet fully open; in transition
Boundary dispute resolution	Based on historical evidence reconstruction and jurisprudence	Often social compromise and boundary deliberation
Role of surveyor	Strictly follows legal documents and standards	Sometimes follows field agreements
Documentation and archiving	Systematic, digitized, public access	Varied; old archives vulnerable to loss; digitalization ongoing
Consequences of standard violations	Firm technical and legal sanctions (fines to cancellation of survey results)	Rarely any systematic technical sanctions

(Source: Author's Synthesis, 2026)

In addition to strengthening the regulatory aspects, the modernization of the land administration system also requires the development of integrated national digital documentation and archiving. Digitalization of land certificates should be accompanied by the digitalization of historical archives, field notes, and all supporting documents that form the basis for the establishment of land rights. The archiving system needs to be built with uniform metadata standards, supported by inter-agency interoperability, and implementing a controlled yet transparent public access mechanism. South Australia's experience of requiring PSM coordinate submission along with PU reporting as part of permanent archives can serve as a reference in building the national land documentation system. At the same time, the regulatory framework also needs to maintain a balance between technical flexibility and administrative accountability by providing limited discretion to technical officials under certain conditions. Such discretion must still meet established accuracy standards, be documented in writing with technical justifications, and be recorded in an auditable system so that every decision remains accountable. This approach is consistent with the *technical exemption* mechanism applied in the Australian Guidelines and can be adapted to the characteristics of the Indonesian land system.

Furthermore, Indonesia needs to develop a mechanism for resolving historical boundary inconsistencies that has a clear legal basis and accountable procedures. This framework can be developed through an approach resembling the CBA, emphasizing party participation, public consultation, and transparent objection mechanisms as part of the boundary determination process. Such an approach will provide greater certainty compared to case-by-case resolution through administrative actions or informal mediation. These efforts need to be supported by the enhancement of human resource professionalism through the implementation of a systematic, risk-based post-survey audit system, accompanied by firm consequences for any violations of technical standards. In this context, the role of professional organizations, such as the *Ikatan Surveyor Indonesia* (ISI), is important to strengthen quality oversight as well as surveyor capacity development. Australia's experience shows that professional integrity is supported by strong law enforcement mechanisms, where the *Survey and Mapping Infrastructure Act 2003* imposes significant sanctions for the submission of incorrect survey certifications or plans. This approach demonstrates that improving the quality of the cadastral system depends not only on technological advancement and regulatory refinement but also on the strengthening of institutional governance, professional accountability, and legal certainty in an integrated manner.

E. Conclusion and Recommendations

1. Conclusion

The comparative study between the cadastral and land registration systems of South Australia and Indonesia demonstrates that legal certainty in land matters depends not only on the technical accuracy of surveys, but also on the integration of regulation, documentation, land registration systems, geospatial infrastructure, and digital governance. South Australia exhibits an integrated land administration system through its coordinated cadastre, the application of Positional Uncertainty, rigorous survey documentation, and a Torrens-based land registration system that provides strong legal protection.

Conversely, Indonesia has made rapid progress through the implementation of GeoKKP, Electronic Certificates, Electronic Mortgage Rights (HT-el), and the One Map Policy. However, various challenges persist, including regulatory fragmentation, overlapping spatial data, weak inter-agency interoperability, and suboptimal synchronization between physical and juridical land data.

The findings of this study affirm that land administration reform in Indonesia needs to be directed toward strengthening spatial-juridical integration, standardization of survey documentation, data transparency, and institutional coordination, rather than merely digitizing services. Although South Australian practices offer valuable lessons, their application must be adapted to the characteristics of Indonesia's legal system, which is marked by legal pluralism and a different institutional structure.

2. Policy Recommendations

Based on the research findings, the strengthening of the cadastral and land registration systems in Indonesia is directed toward five strategic agendas:

1. **Strengthening the Regulatory Framework:** Enhancing land registration regulations through explicit recognition of the Coordinated Cadastre (CC), the inclusion of Positional Uncertainty (PU) in cadastral metadata, and improving legal certainty over spatial data.
2. **Standardization of Survey Documentation:** Building a nationally integrated digital documentation and archiving governance system, encompassing field notes, digital Measurement Drawings (Gambar Ukur), and survey accuracy evaluation reports.
3. **Implementation of Special Procedures for Boundary Correction (Adaptation of CBA):** Developing administrative legal instruments to resolve areas experiencing systematic historical boundary inconsistencies without resorting to court litigation.
4. **Integrated Digital Transformation:** Accelerating the comprehensive integration of the GeoKKP system with electronic land registration (e-conveyancing) toward an interoperable and secure digital land ecosystem.
5. **Strengthening Accountability and the Profession:** Enhancing post-survey audit systems, the development of licensed cadastral surveyors, and strengthening the role of professional organizations in maintaining the quality of physical land data.

3. Research Contributions

This study makes two primary contributions. First, a theoretical contribution in the form of the development of a conceptual framework that integrates cadastre, legal certainty, and land digitalization from the perspective of comparative legal studies. Second, a practical contribution in the form of adaptive policy recommendations regarding the strengthening of the coordinated cadastre, the application of Positional Uncertainty, the development of CBA mechanisms, and the improvement of spatial-juridical data interoperability as a foundation for digital land administration reform in Indonesia. In doing so, this study expands the comparative land law literature, which has tended to address technical or normative aspects separately.

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Conflict of Interest

There is no conflict of interest.

AI Use Declaration

In preparing this manuscript, the author used ChatGPT to check typography and correct grammar. The author has independently reviewed, verified, and re-edited all output from the tool and is fully responsible for the validity and completeness of this article.

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