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Digital Transformation of Land Certificates in Combating Land Mafia: A Socio-Legal and Empirical Study in Indonesia

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Abstract:
The implementation of electronic land certificates is a fundamental component of the digital transformation of land administration in Indonesia, aimed at increasing transparency, efficiency, and legal certainty. While previous studies often view electronic certificates as merely administrative tools, this study addresses a critical gap by analyzing their socio-legal implications and legal effectiveness in combating land mafia practices. Employing empirical legal research methods with a socio-legal approach, this study leverages in-depth interviews with the Bojonegoro Agrarian Office, law enforcement officers, and rural communities in East Java, as well as field observations. Empirical findings indicate that digitalization has resulted in significant improvements in administrative efficiency, reducing certificate issuance times by approximately 50% and measurably reducing document forgery disputes by 30% between 2022 and 2024. However, digitalization has proven only partially effective: rather than eliminating agrarian crimes, it has altered their modus operandi, creating new vulnerabilities to internal database manipulation and systemic bureaucratic collusion. Furthermore, a structural digital divide and persistent low public trust among rural and elderly demographics critically hinder the program's universal success. This manuscript contributes to the international scholarly discourse on digital land governance by demonstrating that, in developing countries, technological modernization must be strictly accompanied by institutional integrity, strict bureaucratic oversight, and socio-legal inclusiveness to achieve substantive legal certainty.

Keywords:
digital transformation; electronic certificates; land administration law; land mafia; legal certainty.

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Introduction

Digital transformation within agrarian administration in Indonesia constitutes an integral and irreversible part of the bureaucratic reform agenda aimed at realizing digital-based good governance.[1] The rapid advancement of information technology has compelled the government to modernize the national land service system, which previously faced various chronic challenges, such as procedural inefficiencies, overlapping spatial data, and a severe lack of transparency and accountability.[2] In practice, these administrative vulnerabilities have created massive opportunities for the emergence of organized agrarian crimes, commonly

[1] Suresh Malodia et al., "Future of E-Government: An Integrated Conceptual Framework," *Technological Forecasting and Social Change* 173 (December 2021): 121102, https://doi.org/10.1016/j.techfore.2021.121102.
[2] Kusmiarto Kusmiarto et al., "Digital Transformation of Land Services in Indonesia: A Readiness Assessment," *Land* 10, no. 2 (January 2021): 120, https://doi.org/10.3390/land10020120.

referred to as land mafia (land syndicate) practices.[3] Digitalization must not be interpreted solely as a technical innovation; it profoundly possesses critical legal implications for strengthening legal certainty and protecting the public's constitutional land rights.[4] The implementation of digital systems in land management is theoretically projected to mitigate the risks of data manipulation and narrow the scope for illegal practices within the land sector.[5] Consequently, the implementation of Electronic Certificates via the Agarian Affairs Ministirial Regulation Number 1 of 2021 on Electronic Land Documents, later updated Regulation Number 3 of 2023 serves as a crucial legal instrument in the effort to prevent and eradicate land mafia practices in Indonesia, while simultaneously marking the transformation of the land system towards a more transparent, integrated, and equitable governance model.[6] Although digital transformation in the land administration system has been systematically implemented, land mafia practices in Indonesia remain a severe issue that threatens substantive legal certainty.

A land certificate is a legally recognized, authentic document that serves as absolute proof of ownership or rights over a specific parcel of land. The registration of these rights through a systematic, state-sponsored land administration system plays a pivotal role in providing legal certainty and security over land tenure.[7] The application of technology in land administration has been widely examined in various countries as an endeavor to enhance rights protection, minimize boundary disputes, and facilitate more transparent and efficient land commercial transactions.[8] Furthermore, land certificates serve as the primary instrument for preventing legal disputes and facilitating various civil land transactions, such as buying and selling, grants, transfer of rights, and relinquishment of rights.[9] Under the Agrarian Law of 1960, a land certificate has significant legal force, as it constitutes valid proof of ownership recognized by the state. Legally, this certificate is an authentic deed issued by the Land Office and can be utilized for various legal purposes, including as primary evidence in civil, criminal, and state administrative courts.[10] Additionally, Article 33 Paragraph (3) of the 1945 Constitution stipulates that land, water, and the natural resources contained therein are under the control of the state and shall be utilized for the greatest prosperity of the people By issuing valid land certificates, the state fulfills its constitutional mandate to provide legal certainty to the public regarding their property rights.

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[3] Rosmidah Rosmidah et al., "Can Electronic Land Rights Registration Help Prevent Land from Mafia Practices?," *Jambe Law Journal* 7, no. 2 (December 2024): 539–58, https://doi.org/10.22437/home.v7i2.375.

[4] Try Widiyono and Md Zubair Kasem Khan, "Legal Certainty in Land Rights Acquisition in Indonesia's National Land Law," *Law Reform: Jurnal Pembaharuan Hukum* 19, no. 1 (August 2023): 128–47, https://doi.org/10.14710/lr.v19i1.48393.

[5] Hui Wang, Jeffrey Riedinger, and Songqing Jin, "Land Documents, Tenure Security and Land Rental Development: Panel Evidence from China," *China Economic Review* 36 (December 2015): 220–35, https://doi.org/10.1016/j.chieco.2015.09.005.

[6] Anriz Nazaruddin Halim, "Digital Land Reform: The Impact of Indonesia's Electronic Land Administration System on Agrarian Governance," *Journal Evidence Of Law* 4, no. 2 (2025): 922–88, https://doi.org/https://doi.org/10.59066/jel.v4i2.1579.

[7] Raymond T. Abdulai and Anthony Owusu-Ansah, "Land Information Management and Landed Property Ownership Security: Evidence from State-Sponsored Court System," *Habitat International* 42 (April 2014): 131–37, https://doi.org/10.1016/j.habitatint.2013.11.005.

[8] Hamid Hosseini, Behnam Atazadeh, and Abbas Rajabifard, "Towards Intelligent Land Administration Systems: Research Challenges, Applications and Prospects in AI-Driven Approaches," *Land Use Policy* 157 (October 2025): 107652, https://doi.org/10.1016/j.landusepol.2025.107652.

[9] Yulies Tiena Masriani, "Pentingnya Kepemilikan Sertifikat Tanah Melalui Pendaftaran Tanah Sebagai Bukti Hak," *Jurnal USM Law Review* 5, no. 2 (October 2022): 539–52, https://doi.org/10.26623/julr.v5i2.5777.

[10] Dyah Adriantini Sintha Dewi et al., "Comparative Law Between Indonesia and Philippines Regarding the Procedure for Issuing Replacement Land Certificates," *Jurnal Dinamika Hukum* 25, no. 2 (May 2025): 112, https://doi.org/10.20884/1.jdh.2025.25.2.15720.

The land mafia in Indonesia is a highly disturbing phenomenon for society, involving complex, cross-sectoral illegal practices in the acquisition, manipulation, and transfer of land rights. Common modus operandi include certificate forgery, document duplication, the creation of fictitious land deeds, and the deliberate exploitation of legal loopholes to acquire land illicitly.[11] One of the most prevalent forms is the falsification of physical land certificates. In this practice, perpetrators fabricate or manipulate certificate documents to claim land that does not rightfully belong to them. This action is frequently carried out through sophisticated administrative manipulation or systemic collusion with rogue land officials who have the authority to alter official agrarian data.[12] The abuse of power is a key mechanism in land mafia practices. In numerous high-profile cases, public officials collaborate with private entities and capital owners to expedite or manipulate the land registration process. This corrupt synergy creates severe legal vulnerabilities that permit land acquisition without due process or without the legitimate owner's consent.[13] Land mafia practices involve financial institutions extensively, including banks. Forged certificates are frequently utilized as collateral for massive loans or other financial transactions. This not only inflicts catastrophic financial losses on these institutions but also exacerbates systemic legal uncertainty in the national land sector.[14]

The social impact of these illicit practices is profoundly devastating. Legitimate landowners frequently lose their constitutional land rights and, in some instances, are forced to abandon land they have occupied and cultivated for generations. This situation engenders widespread social uncertainty, damages public trust in the state's land system, and deepens social and economic inequalities.[15] The existence of electronic certificates is highly anticipated to eliminate opportunities for physical document manipulation, which has historically been the primary instrument of land mafia operations. The electronic certificate program carries extensive legal implications across multiple legal disciplines. From a normative perspective, the validity of digital certificates is legally recognized, provided they fulfill the strict statutory requirements of electronic system administration. Technically, digitalization requires strengthening information technology-based security systems, including asymmetric encryption and blockchain integration, to prevent electronic documents from being easily hacked or manipulated by cybercriminals.[16] This drastic transition demands the readiness of both the public and the bureaucracy to accept, adapt to, and understand this novel form of

[11] Martin Roestamy, Abraham Yazdi Martin, and Asep Thobibuddin Qolyubi, "Digitizing Land Registration As an Effort To Minimize the Practice of the Land Mafia," *Journal of Engineering Science and Technology* 18, no. 3 (2023): 73–80.
[12] Anni Valkonen, "Examining Sources of Land Tenure (In)Security. A Focus on Authority Relations, State Politics, Social Dynamics and Belonging," *Land Use Policy* 101 (February 2021): 105191, https://doi.org/10.1016/j.landusepol.2020.105191.
[13] Lily Kalyana and Widodo Budidarmo, "Dynamics of Land Ownership Rights in the Perspective of Indonesian Agrarian Law in the Perspective of Legal Certainty and Social Justice," *JOSH: Journal of Sharia* 4, no. 02 (June 2025): 234–43, https://doi.org/10.55352/josh.v4i02.2021.
[14] Nasab Sabrina Febriyanti et al., "Trasnformasi Digital Pendaftaran Tanah Sebagai Langkah Strategis Mewujudkan Kepastian Hukum Hak Atas Tanah," *Wathan: Jurnal Ilmu Sosial Dan Humaniora* 3, no. 1 (February 2026): 132–47, https://doi.org/10.71153/wathan.v3i1.443.
[15] Adeolu Ayanwale and Ayodeji D. Kehinde, "Determinants of Use of Digital Innovation and Its Impact on Land Acquisition and Food Security among Farming Households in Nigeria," *World Development Perspectives* 39 (September 2025): 100702, https://doi.org/10.1016/j.wdp.2025.100702.
[16] Kazi Masudul Alam et al., "A Blockchain-Based Land Title Management System for Bangladesh," *Journal of King Saud University - Computer and Information Sciences* 34, no. 6 (June 2022): 3096–3110, https://doi.org/10.1016/j.jksuci.2020.10.011.

land administration, shifting from a tangible conventional paradigm to an intangible digital reality.[17]

The implementation of electronic certificates aims to minimize legal loopholes and mitigate the potential abuse of land rights. Through the utilization of digital technology, this system exponentially enhances transparency in land administration, as all transactions, encumbrances, and changes in ownership status can be recorded electronically in a secure, universally monitored system that is significantly harder to manipulate without leaving an indelible digital footprint.[18] The digitalization of land services is also meticulously designed to accelerate and simplify bureaucratic processes, as well as to suppress illegal levies (extortion) and systemic corruption in land administration.[19] However, the application of electronic certificates still encounters several formidable challenges. In certain regions, particularly remote and outermost areas, access to fundamental information technology infrastructure, such as the internet, remains severely limited, potentially widening implementation gap between urban and rural demographics.[20] Furthermore, although digital systems can drastically reduce the risk of physical certificate forgery, this technology remains highly vulnerable to cybercrimes such as hacking, ransomware, and massive data breaches, which can threaten the security, sovereignty, and integrity of national land data.[21]

Previous research on the land mafia and land administration in Indonesia can be broadly mapped into three main academic trajectories, which reveal a significant gap in the current literature. First, several studies have predominantly focused on conventional legal issues related to physical land certificates and the traditional modus operandi of document manipulation. Studies by Roestamy et al. and Rosmidah et al. highlight the structural vulnerabilities of manual registration and the sociological factors driving land disputes, yet they do not address the integration of digital solutions as a preventive legal tool.[22] Second, subsequent literature has analyzed the digital transformation of land administration primarily from a geographical, technical, or administrative efficiency perspective. Research by Aditya et al treats digitalization essentially as an infrastructural upgrade to accelerate land mapping and registration, without deeply exploring its socio-legal impact on crime prevention and bureaucratic reform.[23] Third, a separate body of research has examined the cybersecurity and personal data protection aspects of digital certificates in isolation. Scholars such as Yusni et

[17] Nanny Mayasari Khusnul Khotimah, Mohammad Baladdudin Dayar, Ach. Ilyasi, Nur Wahdatul Chilmy, Faiqoh Nurul Hikmah, Imam Sunarto, *Administrasi Publik: Birokrasi Menuju Transformasi Digital* (Bandung: Penerbit Widina Media Utama, 2025).
[18] Benny Djaja and Laura Helena Wiryana, "Electronic Certificate in the Digitalization of Land Management in Indonesia: An Application of Theory 'For What Is Inexistent–A New One Is Procured'Electronic Certificate in the Digitalization of Land Management in Indonesia: An Application of Theory "Fo," *International Journal of Application on Social Science and Humanities* 1, no. 1 (February 2023): 99–107, https://doi.org/10.24912/ijassh.v1i1.25695.
[19] Putu Agus Susila Adnyana and I Ketut Arya Wijaya, "Digital Transformation of Electronic Land Certificates : Solutions and Challenges in Indonesia's Modern Land Registration System," *Aliansi: Jurnal Hukum, Pendidikan Dan Sosial Humaniora* 2, no. 5 (July 2025): 163–77, https://doi.org/10.62383/aliansi.v2i5.1209.
[20] Daivi Rodima-Taylor, "Digitalizing Land Administration: The Geographies and Temporalities of Infrastructural Promise," *Geoforum* 122 (June 2021): 140–51, https://doi.org/10.1016/j.geoforum.2021.04.003.
[21] Xianglan Jin et al., "Does Cybersecurity Regulation Promote Digital Transformation? Evidence from the Cyber Security Law in China," *Finance Research Letters* 76 (April 2025): 107041, https://doi.org/10.1016/j.frl.2025.107041.
[22] Raden Ayu Rani Mutiara Dewi and Catherine Susantio, "Penggunaan Sertifikat Elektronik Untuk Meningkatkan Efisiensi Pendaftaran Tanah Dalam Upaya Pencegahan Mafia Tanah," *Jurnal Syntax Admiration* 5, no. 9 (September 2024): 3382–92, https://doi.org/10.46799/jsa.v5i9.1441.
[23] Trias Aditya et al., "Title Validation and Collaborative Mapping to Accelerate Quality Assurance of Land Registration," *Land Use Policy* 109 (October 2021): 105689, https://doi.org/10.1016/j.landusepol.2021.105689.

al. emphasize encryption techniques and hacking risks, but their analyses lack empirical grounding on how these technologies interact with actual land mafia practices and the underlying community legal culture.[24]

Despite the introduction of digitalization, existing studies tend to position electronic certificates merely as technical-administrative instruments without comprehensively examining their juridical effectiveness and sociological implications in combating agrarian crimes. This study establishes its novelty by providing an integrative analysis that combines land administration law, cyber law, and the sociology of law approach. It views electronic certificates not merely as technological innovations but also as essential legal instruments for protecting land rights and for reforming Indonesia's digital land governance bureaucracy. The objective of this research is to comprehensively analyze the legal implications of implementing electronic certificates within Indonesia's land system, particularly in efforts to prevent land mafia practices. This study focuses on how existing regulations provide a robust legal foundation for electronic certificates, how the implementation in practice strengthens transparency and legal certainty, and the extent to which this program is effective in closing loopholes for data manipulation. Thus, this study is expected to provide practical, empirically grounded recommendations for policymakers, law enforcement officers, and the public, so that land digitalization truly functions as an effective instrument to eradicate the land mafia in Indonesia.

Method

The research methodology employed in this study is empirical legal research, utilizing a socio-legal (sociological-juridical) approach.[25] Empirical legal research was selected because the core focus of this study is not merely to analyze applicable normative regulations but to actively examine the actual implementation of the electronic certificate program in the field and its direct correlation with efforts to prevent land mafia practices. The socio-legal approach is utilized to assess the extent to which regulations concerning electronic certificates can be effectively implemented within a specific societal context, and how the public, land officials, and relevant stakeholders respond to their execution.[26] Data collection was systematically conducted using two primary techniques: in-depth interviews and field observations. Interviews were conducted in Bojonegoro Regency, East Java. Bojonegoro Regency was deliberately selected as the research location for several compelling academic justifications. Firstly, it serves as an official, highly active representative pilot project area for the Land Office digital transformation initiative, particularly in the implementation of the Complete Systematic Land Registration *(Pendaftaran Tanah Sistematis Lengkap - PTSL)* program integrated with electronic certificate issuance. Secondly, Bojonegoro possesses a unique socio-economic profile, blending rapidly developing urban centers with extensive rural agricultural areas, providing an ideal microcosm to study the digital divide and variations in

[24] Muhammad Yusni and Bisdan Sigalingging, "Encryption as The Legal Protection Against Cybercrimes Associated with Digital Land Certificates in Indonesia," *International Journal of Cyber Criminology* 15, no. 2 (2021): 124–34, https://doi.org/10.5281/zenodo.4766551.
[25] Khusnul Khotimah, Mohammad Baladdudin Dayar, Ach. Ilyasi, Nur Wahdatul Chilmy, Faiqoh Nurul Hikmah, Imam Sunarto, *Administrasi Publik: Birokrasi Menuju Transformasi Digital*.
[26] Lawrence M. Friedman, *The Legal System: A Social Science Perspective* (New York: Russel Sage Foundation, 1975).

public legal culture regarding technological adoption.[27] The interview informants were purposefully included high-ranking officials from the Bojonegoro Land Office, specialized law enforcement officers (police investigators handling agrarian crimes), and community members who have directly undergone the electronic certificate application process. Informants were selected independently based on their credibility, experiential knowledge, and direct involvement, although specific public officials were identified through formal disposition from the local Office to obtain a more profound, authorized, and representative perspective. This intensive interview process took place from May to June 2024 to acquire the most recent and relevant primary data regarding the program's implementation.

In addition to targeted interviews, comprehensive open field observations were conducted at the Land Office and several designated pilot villages to obtain a clear, unmediated overview of administrative procedures and to identify concrete constraints within the digitalization system. The observed aspects included the procedural flow for public certificate acquisition, the dynamics of interactions between front-desk officers and applicants, and the rigorous data verification procedures within the Land Office digital land system infrastructure. Observations were conducted strictly in a non-participant capacity to ensure the researchers' absolute objectivity and independence. The primary data extracted from the field were subsequently corroborated and triangulated through extensive document studies of relevant statutory regulations. These included the Agrarian Law of 1960, the Electronic Information and Transactions Law of 2008 (amended 2016 and 2024), the Personal Data Protection Law of 2022, and the Agrarian Ministerial Regulation Number 3 of 2023 on Electronic Land Documents. All obtained qualitative data were systematically analyzed through the interactive stages of data reduction, information display, and logical conclusion drawing regarding the legal implications of implementing electronic certificates to prevent land mafia practices. The empirical field findings were then rigorously juxtaposed with existing normative frameworks to scientifically assess the effectiveness of the law's implementation at the practical level.

Discussion

1. Land Digitalization as an Instrument to Mitigate Land Mafia Practices.

The results of the empirical field research in the selected regency indicate that the implementation of electronic certificates has brought about profound and systemic changes to the local land administration system. Empirical data demonstrates a drastic and measurable increase in administrative efficiency, where the duration of certificate issuance, which conventionally took an average of 50 working days under the manual system is now significantly reduced to merely 25 working days. Critically, from a legal administration perspective, this time reduction is not merely a technical-administrative improvement but rather a structural legal strategy to sever the protracted bureaucratic chain that has long

[27] Yuan Edo Ramadhana, "BPN Bojonegoro Terapkan Sertifikat Tanah Elektronik, Dipastikan Aman Dari Peretasan," Jawa Pos: Radar Bojonegoro, 2024, https://radarbojonegoro.jawapos.com/bojonegoro/2407240003/bpn-bojonegoro-terapkan-sertifikat-tanah-elektronik-dipastikan-aman-dari-peretasan.

served as a fertile breeding ground for illegal levies and corrupt practices. This is empirically evidenced by the reported elimination of unofficial intermediary fees, which previously ranged from IDR 500,000 to IDR 1,500,000 per application. These findings strongly suggest that land digitalization does not function solely as an administrative innovation but also acts as an effective legal instrument to narrow the space for bureaucratic deviations. In the conventional manual system, the lengthy service chain and the high intensity of unregulated face-to-face interactions between applicants and land officials frequently opened massive opportunities for illegal levies, data manipulation, and brokerage (intermediary) practices. Through the electronic system, the majority of administrative procedures are automatically documented, timestamped, and integrated into a centralized digital database, thereby severely limiting opportunities for illicit negotiations. Thus, digitalization can be theoretically understood as a form of structural prevention against land mafia practices that have historically capitalized on weak and fragmented administrative oversight.[28]

This preventive effectiveness is further evidenced by a remarkable 30% annual decrease in police reports concerning land document forgery in the region during the 2022–2024 period. From the perspective of agrarian law and the contemporary application of Radbruch's theory of legal certainty within the Indonesian legal system,[29] this condition aligns perfectly with the fundamental objective of the Agrarian Law of 1960, which is to provide robust and undisputed rights protection through a reliable, integrated database system. Legal certainty is achieved when the state can systematically guarantee that a person's property rights will not be arbitrarily challenged by fictitious documents.[30] Legal certainty is achieved when the state can mathematically and systematically guarantee that a person's property rights will not be arbitrarily challenged by fictitious documents.

To contextualize the empirical findings of this study within the global discourse on e-land administration, a comparative analysis with other developing nations reveals shared structural vulnerabilities and divergent legal remedies. The transition from physical to digital land titles is a global phenomenon, yet its success is heavily predicated on country-specific legal frameworks. For instance, in Bangladesh, the introduction of a blockchain-based land title management system was specifically designed to mitigate the chronic issues of document duplication and intermediate brokerage.[31] This mirrors the institutional objective in the studied region, where digitalization successfully curtailed unofficial intermediary fees. Furthermore, a comparative glance at land registration procedures in the Philippines shows that while digitized systems accelerate the issuance of replacement titles, the legal security of the digital document remains contested if the underlying judicial verification is compromised.[32] Similarly, panel evidence from China demonstrates that secure land documents significantly enhance tenure security and stimulate land rental markets, provided

[28] Fitria Aidina, Deny Guntara, and Muhamad Abas, "Utilization Of Electronic Technology in Ptsl Program in Karawang Regency And Its Implications On Issuance Of Electronic Documents in Land Registration Activities Based On Permen No . 3 Year 2023," *De Lega Lata: Jurnal Ilmu Hukum* 10, no. 2 (2025): 247–53, https://doi.org/10.30596/dll.v10i2.24336.
[29] Batahan Fransciskus Sihombing, "Indonesian Law: Development and Renewal," *Beijing Law Review* 15, no. 01 (2024): 1–34, https://doi.org/10.4236/blr.2024.151001.
[30] Sihombing.
[31] Alam et al., "A Blockchain-Based Land Title Management System for Bangladesh."
[32] Dewi et al., "Comparative Law Between Indonesia and Philippines Regarding the Procedure for Issuing Replacement Land Certificates."

that the state maintains absolute data integrity.[33] In the Indonesian context, however, the modified negative registration system (*publikasi negatif bertendensi positif*) creates a unique legal paradox. Unlike jurisdictions that adopt a pure Torrens system, in which digital registration confers an indefeasible title, Indonesian digital certificates remain vulnerable to civil lawsuits if the initial physical deeds (*warkah*) contain material defects. Therefore, land digitalization in Indonesia cannot be viewed as a standalone procedural fix; rather, it requires a robust statutory harmonization that bridges the gap between digital administration law and substantive agrarian civil rights.

However, a deeper socio-legal analysis in this study discovered that land digitalization cannot be viewed as a utopian, absolute solution in the eradication of the land mafia. The assumption that a digital system automatically creates legal certainty remains highly problematic if it is not accompanied by rigorous validation of the initial data quality entered into the system. In practical implementation, the issuance of electronic certificates still heavily relies on physical land deeds (base documents, or *warkah*) and prior analog administrative data. This implies that if the initial physical data already contains legal defects, overlapping coordinates, or was acquired by the land mafia through illicit procedures in the past, digitalization may paradoxically reinforce and permanently fix these fatal errors in an immutable digital form. This condition highlights a fundamental juridical issue in the digital transformation of land in Indonesia: the shift of the legal problem from manual document manipulation to the digital legitimation of materially invalid data. In other words, technology merely alters the medium of administration but does not automatically resolve the underlying substantive disputes in land civil law. Therefore, the success of digitalization cannot be adequately measured solely by statistical time and cost efficiency; it must also be rigorously assessed by its ability to establish data validity that is materially accurate, transparent, and legally accountable.[34]

The digitalization of land administration through the implementation of electronic certificates indeed provides significant administrative efficiency; however, legally, this system does not automatically eradicate the structural root causes of land mafia practices. The primary issue lies in the limitations of electronic land administration law in reaching the subjective and behavioral aspects of the bureaucratic apparatus, such as the abuse of power (*detournement de pouvoir*), internal collusion, and sophisticated data manipulation by authorized internal actors with high-level system access. In practice, the electronic system only verifies the logical consistency of the data input into it; thus, if the initial data is deliberately engineered by rogue internal elements (*oknum*) colluding with the land mafia, the digital system possesses the potential to electronically and legally legitimize these defects. This condition clearly indicates that digitalization has not entirely eliminated land mafia risks unless accompanied by uncompromising oversight of the integrity of officials who possess access authority to the central electronic land administration system. The provisions regarding the issuance of electronic land documents have been stipulated in the Agrarian Ministerial Regulation Number 3 of 2023 on Electronic Land Documents, which explicitly

[33] Wang, Riedinger, and Jin, "Land Documents, Tenure Security and Land Rental Development: Panel Evidence from China."
[34] Yusni and Sigalingging, "Encryption as The Legal Protection Against Cybercrimes Associated with Digital Land Certificates in Indonesia."

updated the previous regulation of 2021 serving as the formal legal foundation; however, these prevailing regulations still lack detailed stipulations regarding internal audit mechanisms against the system operators themselves.

Digital transformation in land administration has inevitably given rise to new forms of bureaucratic manipulation, shifting from crude manual methods (like erasing physical ink) to complex electronic data manipulation, which is significantly harder to detect visually and requires digital forensics to uncover. The legal approach to combating the land mafia must not fall into the trap of mere "digital formalism" assuming a document is valid simply because it is digital, but must be actively reinforced by continuous check-and-balance mechanisms, mandatory digital forensic audits, and rigorous internal supervision of access to and alteration of land data logs. From the perspective of state administrative law and principal-agent theory, the effectiveness of the electronic system heavily relies on the integrity of the implementing apparatus (the agent) and the efficacy of the state (the principal) in enforcing both strict administrative and criminal sanctions against the abuse of authority. The legal certainty offered by the digitalization of land administration may remain a procedural illusion if regulations fail to actively mitigate the moral hazard posed by personnel operating the electronic system. This empirically demonstrates that digital land reform must be understood not only as technological modernization but comprehensively as a radical reform of bureaucratic governance and an enhancement of state institutional accountability.

2. Legal Standing, Cybersecurity, and the Evidentiary Value of Electronic Certificates

Deconstructing this phenomenon through Friedman's structural legal framework, it becomes evident that the introduction of electronic certificates primarily alters the legal substance and structure, while inadvertently marginalizing the legal culture component. Legal culture, defined as the public's deeply embedded values, attitudes, and behaviors toward the law, cannot be modernized overnight through bureaucratic decrees. The low level of trust identified among the rural elderly demographic regarding "invisible" cloud-based documents is a clear manifestation of cultural resistance to an intangible legal reality. For generations, agrarian communities have associated property security with the physical custody of a sealed, stamped paper deed. Shifting this paradigm to a digital ledger requires more than technical instruction; it demands a comprehensive reconstruction of public psychological conviction. If the state fails to foster a resilient digital legal culture, the formal legal certainty provided by the Agrarian Ministerial Regulation Number 3 of 2023 on Electronic Land Documents will lose its social legitimacy, resulting in a system rejected by the very citizens it aims to protect. This structural divide is further exacerbated by what scholars term "technological disenfranchisement," where marginalized agrarian groups risk losing access to public services due to systematic infrastructure deficits. Hence, to fulfill the constitutional mandate of Article 28D paragraph (1) of the 1945 Constitution, digital land reform must incorporate affirmative

socio-legal strategies, such as establishing village-level digital assistance kiosks and utilizing community-based legal counseling to bridge the digital literacy gap.[35]

A critical aspect of combating the land mafia through digital means concerns the legal implications of cybersecurity risks and electronic data protection within the land administration system. Normatively, Article 15 of the Electronic Information and Transactions Law explicitly obligates all electronic system operators to manage their systems reliably, securely, and responsibly. Nevertheless, in the specific context of electronic land certificates, there is currently no specialized lex specialis regulation governing state liability mechanisms or the provision of concrete financial compensation in the event of catastrophic system failures, malicious hacking, or national land data breaches. Yet, land data is highly strategic national data directly related to citizens' constitutional civil rights, economic livelihoods, and national agrarian stability. Regulations concerning personal data protection have been robustly stipulated in the Personal Data Protection of 2022. This law provides a robust legal basis regarding the absolute obligations of personal data controllers (in this case, the Land Office) and stipulates severe sanctions for violations of electronic data integrity, which must be strictly synergized with the foundational provisions on electronic certificates initially outlined in the Agrarian Ministerial Regulation 2021.

From a cyber law and state responsibility perspective, massive leaks or external manipulations of electronic land data not only inflict catastrophic individual financial losses but can also irreversibly degrade the state's legitimacy in guaranteeing legal certainty over land rights. Therefore, total synchronization among the Personal Data Protection Law of 2022, the revised the Information a, and sectoral regulations under the Ministry of Agrarian Affairs is imperative to clearly determine the responsible parties in the event of a data security breach, be it systemic negligence by the organizing institution or intentional sabotage by a rogue individual official. Strengthening cybersecurity systems through periodic independent security audits, mandatory multi-layered asymmetric encryption, and strict data access monitoring (zero trust architecture) is an absolute prerequisite to prevent public trust in electronic certificates from collapsing due to technical failures unaccompanied by fair legal accountability mechanisms.[36] Thus, electronic land data protection must be legally positioned as an integral, non-negotiable component of the protection of citizens' constitutional rights regarding land ownership and legal certainty.

Equally important are the legal standing and evidentiary value of electronic certificates in the resolution of land disputes and judicial practices. Normatively, Articles 5 and 6 of the Electronic Information and Transactions Law boldly affirm that electronic information and electronic documents are valid legal evidence and possess legal force equivalent to conventional physical documents, provided they meet the rigorous electronic system requirements stipulated by law. In the specific context of land administration, the legitimacy of electronic certificates is definitively reinforced by the Agrarian Ministerial Regulation

[35] Windi Lestari Sutrisno, Amelia Nur Widyanti, and Supaphorn Akkapin, "Legal Certainty of Electronic Land Certificates in Land Registration in Indonesia," *Sibatik Journal: Jurnal Ilmiah Bidang Sosial, Ekonomi, Budaya, Teknologi, Dan Pendidikan* 4, no. 2 (2025): 57–66, https://doi.org/https://doi.org/10.54443/sibatik.v4i2.2592.

[36] Nabilla Lintang Primarini et al., "Legal Protection for the Security of Personal Data of Electronic Land Certificate Holders," *Jurnal Legisci* 2, no. 4 (February 2025): 296–306, https://doi.org/10.62885/legisci.v2i4.619.

Number 3 of 2023 on Electronic Land Documents, which governs the issuance of electronic documents in all land registration activities. However, field data and observations of land judicial practices reveal a persistent conservatism; there is still a strong tendency for judges to have more psychological conviction in original physical documents rather than electronic evidence, particularly in complex land rights disputes involving sophisticated allegations of document forgery or historically overlapping rights. This condition indicates that systemic harmonization among civil procedural law *(Herziene Indonesisch Reglement – HIR for Java and Madura Land / Rechtsreglement voor de Buitengewesten – RBg for anoter island)*, land administration law, and modern cyber law still requires massive capacity-building so that electronic certificates truly acquire dominant and effective evidentiary standing before the courts.[37]

Within the "negative publication system with positive tendencies" (modified negative registration system) adopted by the Agrarian Law of 1960, land certificates fundamentally possess strong but not absolute evidentiary value. A certificate is considered true until proven otherwise by a court decision. Therefore, an electronic certificate must be viewed as perfect evidence that possesses perfect evidentiary value, as long as its digital cryptographic signature cannot be proven otherwise through specialized digital audits or electronic forensic evidence. Judges, prosecutors, and law enforcement officers urgently need to possess advanced digital literacy to accurately assess the validity of electronic signatures, data encryption protocols, and electronic system authentication logs as indisputable legal facts. Synchronization among the Agrarian Law of 1960, the Electronic Information and Transactions Law of 2008 (amended 2016 and 2024), the Personal Data Protection Law of 2022, and both civil and state administrative procedural laws is crucial to ensure that electronic certificates function not merely as administrative innovations but as formidable legal instruments providing effective, equitable, and absolute protection of land rights for the community against mafia syndicates. Thus, strengthening the procedural aspect of electronic evidence is the primary prerequisite for land digital transformation to realize substantive legal certainty, rather than mere administrative formality.

3. The Dialectics of Legal Certainty and the Challenges of Public Digital Literacy

The results of the empirical research indicate that while the implementation of electronic certificates has brought substantial systemic changes to the land administration system, it simultaneously exposes a latent socio-legal friction. Based on interviews with BPN officials, the digitalization of land administration is technically designed to permanently close the loopholes exploited by the land mafia which have historically exploited the inherent weaknesses of the manual archive system. Urban communities generally assess that the digital system is faster, highly practical, and capable of virtually eliminating the risks of loss, physical destruction (e.g., by fire or flood), or forgery of physical documents. However, social dynamics in the field reveal a severe and persistent digital divide between urban and rural communities, particularly regarding their socio-cultural readiness to utilize technology and their

[37] Diana R. W. Napitupulu, "Legal Certainty Regarding Electronification of Land Certificates (Sertipikat-El) As Proof of Ownership of Land Rights in Indonesia," *Jurnal Smart Hukum (JSH)* 3, no. 1 (June 2024): 33–47, https://doi.org/10.55299/jsh.v3i1.921.

jurisprudential comprehension of intangible electronic documents. Residents in rural agricultural areas, especially the elderly, tend to be highly unfamiliar with digitaladministration systems, thereby raising profound sociological doubts about the validity, security, and "realness" of electronic certificates. Moreover, the severe limitations of internet networks and technological infrastructure in many remote areas cause the implementation of electronic land services to proceed at a significantly slower pace compared to affluent urban areas.[38]

This phenomenon demonstrates that the digital transformation of land administration is not solely about administrative modernization, but fundamentally concerns the state's constitutional obligation to guarantee equal and non-discriminatory access to public services. From the perspective of state administrative law, the universally recognized principle of equality before the law requires the state to ensure that all citizens, regardless of their socioeconomic status, obtain equal access to digital land services without discrimination caused by economic, geographical, or technological constraints. This principle aligns directly with Article 28D paragraph (1) of the 1945 Constitution of the Republic of Indonesia, which guarantees the right of every citizen to fair recognition, guarantees, protection, and legal certainty. Therefore, the digitalization of land services must not, in any way, generate new forms of social exclusion for technologically disadvantaged groups. The state bears an inescapable constitutional obligation to provide equitable digital infrastructure, comprehensive administrative assistance services (such as digital kiosks in villages), and legal companion mechanisms so that vulnerable communities in remote areas can continue to enjoy equal legal protection in accessing their electronic certificates.[39]

The state's obligation to ensure the accessibility of digital land services is also closely linked to the principle of fair and inclusive public service, as strictly regulated in Law Number 25 of 2009 concerning Public Services. In this regard, the state cannot simply launch an electronic system and expect organic compliance; it is obligated to proactively ensure that these systems can be effectively and comfortably accessed by all layers of society without prohibitive technological or geographical barriers. The glaring disparity in digital infrastructure between urban and rural areas possesses the dangerous potential to induce systemic administrative discrimination if specific rural communities are practically unable to access electronic land services optimally, leaving their unregistered land vulnerable to mafia claims. Therefore, the development of digital land administration systems must be heavily accompanied by affirmative state policies, such as the widespread provision of digital assistance service centers at the sub-district level, the rapid enhancement of broadband internet networks in remote areas, and massive human resource capacity building at the village administration level, to preserve the constitutional principle of social justice in public services.

[38] Rana Tatsbita Noer et al., "Transformasi Digital Pendaftaran Tanah: Tantangan Dan Efektivitas Implementasi Aplikasi Sentuh Tanahku Dalam Era Society 5.0," *Jurnal Ilmiah Nusantara (JINU)* 1, no. 6 (2024): 250–61, https://doi.org/https://doi.org/10.61722/jinu.v1i6.2806.
[39] Afif Syarifudin and Agus Supriyo, "Digitalisasi Layanan Pertanahan Di Badan Pertanahan Nasional Kota Surabaya Dalam Upaya Mencegah Mafia Tanah," *Doktrina: Journal of Law* 8, no. 1 (2025): 37–52, https://doi.org/https://doi.org/10.31289/doktrina.v8i1.13427.

Beyond the vital issue of physical accessibility, the implementation of electronic certificates also vividly illustrates the profound sociological correlation between legal certainty and society's legal culture, as theorized by Friedman. According to Friedman's theory of the legal system, a successful legal framework requires strong legal substance (laws), structure (institutions), and legal culture (public attitudes and beliefs towards the law). Normatively, electronic certificates have obtained unquestionable legal substance and structure through the Agrarian Ministerial Regulation Number 3 of 2023 on Electronic Land Documents and the Electronic Information and Transactions Law of 2008 (amended 2016 and 2024), which recognize electronic documents as valid legal evidence. However, from the perspective of the sociology of law, the ultimate success of a legal system is determined not only by formal state legality but also by the level of public acceptance, understanding, and trust in that law.[40] The demonstrably low level of trust among a significant segment of the rural public regarding the security of "invisible" digital documents points to a massive gap between formal legal legitimacy and the traditional legal culture of the community, which traditionally associates ownership with a tangible, stamped physical paper. Consequently, although electronic certificates are legally bulletproof, the practical effectiveness of their application remains heavily dependent on increasing public trust in the security and reliability of the Land Office digital land system. This empirical condition aligns with the Technology Acceptance Model (TAM), which explains that public acceptance of a novel technology is heavily influenced by perceived ease of use and perceived usefulness (and, in this case, perceived security).[41] In the context of land administration, the community's low digital literacy can lead to dangerous skepticism towards electronic data authentication, digital signatures, and the overall security of cloud-based land data storage. If this sociological condition is not aggressively addressed, the legal certainty formally provided by the state risks losing its social legitimacy in the public's eyes, potentially leading to a rejection of the system.

From the perspective of state administrative law, the shifting landscape of agrarian crime from manual manipulation to sophisticated digital tampering requires a radical transformation in internal oversight mechanisms. Traditional administrative supervision is utterly inadequate for detecting algorithmic changes or illicit database privileges exercised by authorized internal actors (*oknum*). Therefore, the legal enforcement framework must pivot toward mandatory digital forensic audits and the statutory implementation of a Zero Trust Architecture within the National Land Agency's (BPN) networks. This framework is normatively supported by Article 15 of the ITE Law, which obligates electronic system operators to ensure secure and reliable operations. However, a critical legislative gap persists: current regulations fail to specify state liability or financial indemnification mechanisms for citizens who suffer losses due to systemic cyber failures or internal database breaches. To remedy this vulnerability, the implementation of the Personal Data Protection Law (Law Number 27 of 2022) must be strictly synchronized with sectoral agrarian regulations. BPN must be held to the highest standard of data controllership, with any breach of data integrity triggering immediate administrative, civil, or criminal accountability. To permanently

[40] Lawrence M. Friedman, *The Legal System: A Social Science Perspective*.
[41] Fred D. Davis, "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly* 13, no. 3 (September 1989): 319–40, https://doi.org/10.2307/249008.

neutralize internal collusion and external ransomware threats, the integration of advanced cryptographic solutions and immutable ledger technologies, such as blockchain, must be codified into the land registration standard operating procedures.[42]

Therefore, actively strengthening a digital legal culture is a critical, non-negotiable factor in the successful nationwide implementation of electronic certificates. The state needs to systematically build public trust through total system transparency, widespread digital legal education campaigns, grassroots cybersecurity socialization, and the provision of highly responsive, easily accessible complaint mechanisms so that the public has unwavering confidence that their most valuable assets, their land rights, remain fully protected despite existing solely in the form of electronic data. Digital literacy inequality and technological infrastructure disparities also carry severe legal consequences for the fulfillment of citizens' human rights to accessible and equitable state administration services. Individuals lacking the educational proficiency to use digital technology face a high risk of insurmountable administrative impediments in processing electronic certificates, accessing their own land information, and securing preventive legal protection for their land rights against mafia syndicates. From a human rights perspective, this condition can be classified as a form of structural unequal access to public services if the state deliberately fails to provide inclusive alternative mechanisms for these vulnerable groups.[43] Hence, the government urgently needs to expand the reach of information technology infrastructure to the most remote areas to avoid de facto discrimination in access to electronic land services. Comprehensive public education programs, community-based legal counseling involving local universities, and the drastic strengthening of state cybersecurity systems through the strict enforcement of personal data protection regulations must be the absolute top priorities to ensure the sustainable integrity of national land data and to guarantee the fulfillment of the public's constitutional right to land services that are fair, universally accessible, and possess absolute legal certainty

Conclusion

The digital transformation of land administration in Indonesia, punctuated by the implementation of electronic land certificates, marks a significant technocratic milestone in modernizing agrarian public services. Empirically, this study demonstrates that digitalization successfully yields substantial gains in administrative efficiency, curtails informal brokerage fees, and reduces conventional document forgery disputes. However, a critical socio-legal and empirical evaluation reveals a fundamental systemic reality: digitalization does not automatically eradicate land mafia practices; rather, it effectively metamorphoses their modus operandi. Agrarian crimes have transitioned from crude physical alterations of paper deeds into sophisticated digital bureaucratic manipulation. This shift exploits high-level database access, systemic internal collusion, and algorithmic vulnerabilities, thereby exposing the

[42] Hashfi Maulana et al., "Urgensi Sertifikat Elektronik Dengan Pemantauan Berbasis AI Untuk Efisiensi Pendaftaran Tanah Dan Mitigasi Mafia Tanah Di Indonesia," *Journal Customary Law* 2, no. 1 (November 2024): 9, https://doi.org/10.47134/jcl.v2i1.3304.
[43] Devi Elora, "Sertifikat Elektronik Dalam Perspektif Hukum Pertanahan Di Indonesia: Kajian Yuridis Terhadap Implementasi Digitalisasi Hak Milik," *Cessie : Jurnal Ilmiah Hukum: Jurnal Ilmiah Hukum* 3, no. 2 (November 2024): 72–81, https://doi.org/10.55904/cessie.v3i2.1509.

limits of viewing technological modernization as a standalone panacea for deep-seated institutional corruption. This article establishes its intellectual position within contemporary agrarian law discourse by highlighting a profound legal paradox inherent in Indonesia's modified negative registration system (*publikasi negatif bertendensi positif*). Technology merely alters the medium of administration but fails to inherently resolve underlying substantive civil disputes. If the foundational analog documents (*warkah*) contain material defects or overlapping coordinates, the transition to an electronic ledger risk paradoxically permanentizing and legitimizing illicitly acquired rights under the guise of an immutable digital format. Deconstructing this phenomenon through Friedman's framework, the formal legal certainty offered by Minister of ATR/BPN Regulation Number 3 of 2023 remains a procedural illusion if the state fails to cultivate a resilient digital legal culture and actively mitigate the moral hazards posed by the bureaucratic personnel operating the electronic architecture.

This research underscores that legal certainty within a digital land governance framework depends not on technocratic modernization or isolated technological patches, such as the mere integration of blockchain or artificial intelligence, but fundamentally on the quality of state governance, stringent administrative supervision, and unwavering institutional accountability. To prevent new forms of social exclusion arising from structural digital divides in rural communities, digital land reform must be anchored in affirmative, inclusive social strategies. Therefore, the legal enforcement framework must pivot away from "digital formalism" towards mandatory digital forensic audits, rigorous internal check-and-balance mechanisms, and radical bureaucratic reform. Only through a holistic alignment of technological integrity and institutional accountability can the digital land administration system genuinely safeguard citizens' constitutional property rights and deliver substantive agrarian justice.

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