

Digital Revolution in Land Affairs: Transformation of Land Certificates Through Electronic Mortgage Service

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Abstract

This study analyzes the digital transformation of Indonesia's land administration through the implementation of the Electronic Mortgage (HT-el) system, which replaces conventional mortgage registration with a fully online process. Using a normative legal research method supported by deductive qualitative analysis, this research examines the regulatory, technical, and institutional challenges faced by Land Deed Officials (PPAT) in adapting to the digital environment. Findings reveal that the transition to electronic land certificates encounters multiple obstacles, including

insufficient infrastructure, inconsistent data integration, limited digital literacy, and ambiguities in legal accountability between PPAT and other stakeholders. Despite these challenges, the HT-el system enhances transparency, reduces document falsification risks, and accelerates service delivery. However, its long-term success depends on strengthening legal frameworks, improving human resource capacity, ensuring cybersecurity, and fostering public digital inclusion. This study contributes to the discourse on e-governance and legal modernization by highlighting how technological adaptation reshapes legal certainty and administrative justice within Indonesia's agrarian reform.

Keywords

HT-el; Land Registration; Digital Transformation; ATR/BPN; Legal Certainty; Indonesia; Land Deed Official (PPAT).

I. Introduction

Information technology constitutes a fundamental pillar of contemporary society, facilitating the creation, modification, storage, and dissemination of information in a more efficient and systematic manner.¹ The information society era is fundamentally dependent on information and communication technology (ICT), where knowledge and data constitute the core assets that propel social, economic, and

¹ Brenky Jie et al., "Pemanfaatan Dan Dampak Penggunaan Teknologi Informasi Pada Bidang Sosial," *Journal of Information System and Technology* 4, no. 2 (2023), <https://api.semanticscholar.org/CorpusID:275714619>.

cultural advancement.² In the field of education, ICT has proven to be highly distinctive and effective in enhancing students' interest when integrated into teaching and learning activities.³ Technology also exerts a significant impact on religious life, transforming methods of religious education through the use of e-learning platforms and digital applications.⁴ Although it offers substantial benefits such as long-distance communication and improved information accessibility, information technology also presents challenges, including societal dependence and the digital divide.⁵

Along with technological advancement, the world of work is inevitably facing a digital transformation amid the rapid development of modern technology. Under the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN), the Indonesian government as a state institution assisting the president in agrarian and spatial affairs has implemented land services that adapt to technological progress. Since 2017, the government has initiated the digitalization of the land administration system through the launch of several electronic information services, including certificate verification, Land Registration Information Letters (SKPT), and Land Value Zone (ZNT) services. This stage of transformation continued with the introduction

² Egun Dalan Saputra and Anis Masruri, "Peran Teknologi Dalam Membentuk Masyarakat Informasi Modern," *Jurnal Ilmu Informasi Perpustakaan Dan Kearsipan* 13, no. 2 (2024), <https://doi.org/https://doi.org/10.24036/jiipk.v13i2.132192>.

³ Erlan Saefuddin, Nova Darmanto, and H A Ul Husna, "Pemanfaatan Teknologi Informasi Dan Komunikasi Sebagai Media Pembelajaran Di Politeknik Negeri Media Kreatif," *Jurnal Teknologi Informasi & Komunikasi Dalam Pendidikan* 10, no. 1 (2023): 33.

⁴ Rizki Surya Tawaqal and Ridma Meltareza, "Teknologi Perubahan Terhadap Kehidupan Beragama," *Jurnal Lensa Mutiara Komunikasi* 6, no. 1 (2022), <https://doi.org/10.51544/jlmk.v6i1.3141>.

⁵ Jie et al., "Pemanfaatan Dan Dampak Penggunaan Teknologi Informasi Pada Bidang Sosial"; Saputra and Masruri, "Peran Teknologi Dalam Membentuk Masyarakat Informasi Modern."

of the Electronic Mortgage (HT-el) service in 2019 as part of a national policy toward an integrated digital land administration system.⁶

This digital transformation is not merely an administrative innovation but also rests on a strong legal foundation. The implementation of electronic land certificates is regulated under the Regulation of the Minister of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) No. 1 of 2021 concerning Electronic Certificates, which serves as a key instrument in realizing the principles of legal certainty, service efficiency, and the prevention of land disputes. This regulation aims to address longstanding issues in land administration, such as certificate duplication, overlapping land rights, and the widespread practices of land mafia activities that harm the public.⁷ Through digitalization, the government seeks to establish a national land database that is integrated, secure, and transparent, thereby strengthening public trust in Indonesia's agrarian legal system. Nevertheless, the implementation of the electronic land administration system still faces several fundamental challenges that hinder its effectiveness, both technically and juridically. In practice, Land Deed Officials (PPAT) as the primary actors in the registration of mortgage rights encounter various practical obstacles. Although the electronic land certificate is intended to enhance data validity and security, PPATs often experience difficulties such as application errors, poor internet connectivity, and system maintenance issues, all of which lead to delays in the registration of mortgage rights.⁸

⁶ Kurnia Rheza Randy Adinegoro, "Analisis Transformasi Digital Layanan Publik Pertanahan : Hak Tanggungan Elektronik Pada Kementerian Agraria Dan Tata Ruang," *Jurnal Administrasi Publik* 19, no. 1 (2023), <https://doi.org/10.52316/jap.v19i1.135>.

⁷ Esther Masri and Hirwansyah, "Kebijakan Penerbitan Sertipikat Elektronik Pada Sistem Pendaftaran Tanah Di Indonesia Untuk Mewujudkan Kepastian Hukum," *KRTHA BHAYANGKARA* 17, no. 1 (2023), <https://doi.org/10.31599/krtha.v17i1.2109>.

⁸ Intan Rifka Auliani and Kholis Roisah, "Peranan Pejabat Pembuat Akta Tanah Dalam Pelaksanaan Transformasi Digital Layanan Pertanahan Melalui Sertipikat

The transition from analog to electronic land certificates, which began to be implemented gradually on July 1, 2024, also requires a thorough verification process of both physical and juridical data. This process often takes considerable time due to the large volume of documents and data that have not yet been fully digitized.⁹ In the technical context, server disruptions, unstable internet connections, and inconsistencies between data from regional land offices and the central BPN database remain recurring issues.¹⁰ These findings illustrate that the effectiveness of the digital land administration system relies not solely on regulatory adequacy but also on the readiness of technological infrastructure and the integration of data across regions. Furthermore, an analysis of data readiness indicates that spatial data accuracy currently stands at 89.55%, with 10.45% of records exhibiting overlapping boundaries, while the compliance rate for land book validation reaches only 75.02%.¹¹ These data confirm that the digitalization process still faces fundamental challenges concerning data consistency and quality. Other obstacles that exacerbate the situation include limited technological infrastructure in regional areas, low levels of digital literacy among the public, cybersecurity issues, and a shortage of human resources with expertise in information technology.¹²

D From a legal perspective, there remains juridical uncertainty regarding the division of responsibilities between Land Deed Officials (PPAT) and mortgage holders in the electronic registration process.

Tanah Elektronik,” *Legal Standing: Jurnal Ilmu Hukum* 9, no. 2 (2025): 394–407.

⁹ Auliani and Roisah.

¹⁰ Sandi Halim et al., “Pelaksanaan Pendaftaran Hak Tanggungan Secara Elektronik,” *Locus Journal of Academic Literature Review*, 2022, <https://doi.org/10.56128/ljoalr.v1i8.110>.

¹¹ Septina Marryanti and Arsan Nurrokhman, “Kesiapan Data Pertanahan Menuju Pelayanan Online,” *Administrasi Pertanahan Dan Tata Ruang Di Indonesia Mrnuju Modern, Digital Dan Terpercaya*, 2019.

¹² Auliani and Roisah, “Peranan Pejabat Pembuat Akta Tanah Dalam Pelaksanaan Transformasi Digital Layanan Pertanahan Melalui Sertipikat Tanah Elektronik.”

This lack of clarity has the potential to trigger legal disputes in cases of data entry errors or delays in the registration process.¹³ This situation indicates an urgent need to strengthen both the normative and institutional aspects to ensure that the implementation of the Electronic Mortgage (HT-el) operates in accordance with the principles of accountability, legal certainty, and administrative effectiveness in land affairs. Accordingly, the digital transformation of land administration in Indonesia represents a progressive step toward bureaucratic modernization and agrarian law reform. However, the success of this initiative largely depends on the synergy between improvements in digital infrastructure, the enhancement of institutional and public capacity, regulatory reform, and the enforcement of good governance principles. Therefore, this study is essential to further analyze the dynamics of Electronic Mortgage service implementation, identify the challenges faced by Land Deed Officials (PPAT), and evaluate the effectiveness of government policies in establishing a digital land administration system that is transparent, secure, and equitable.¹⁴

The digital transformation of land administration in Indonesia represents a progressive step toward bureaucratic modernization and agrarian law reform. The implementation of electronic land certificates serves as a pivotal milestone in realizing efficient, secure, and transparent land governance. This initiative is not merely aimed at simplifying administrative services but also at enhancing the integrity and accountability of the national land administration system. Nevertheless, the adoption of electronic land certificates in Indonesia continues to face several challenges, including disparities in technological

¹³ Halim et al., “Pelaksanaan Pendaftaran Hak Tanggungan Secara Elektronik.”

¹⁴ Marryanti and Nurrokhman, “Kesiapan Data Pertanahan Menuju Pelayanan Online.”

infrastructure, low levels of digital literacy, and concerns regarding data security and privacy.¹⁵

The Electronic-Based Government System (SPBE) initiated by the government demonstrates a strong commitment to bureaucratic reform grounded in information and communication technology. However, in practice, the implementation of SPBE has not yet reached full optimization, as it continues to face structural barriers such as conventional bureaucratic culture, uneven infrastructure across regions, and technical challenges in service integration systems.¹⁶ In this context, the Electronic Mortgage (HT-el) service represents a concrete manifestation of this transformation, shifting the mechanism of mortgage rights registration from a manual system to a digital one, with the added dimension of enhancing the quality of public service delivery.¹⁷

This policy derives its strong legal foundation from Presidential Regulation No. 177 of 2024, which governs the restructuring of land governance through organizational reform, service digitalization, and the strengthening of human resource capacity. However, its implementation continues to encounter obstacles, including internal bureaucratic resistance and technological disparities in remote regions.¹⁸ In a broader framework, the success of digital land transformation

¹⁵ Sy Arifin Habibi et al., “Transformasi Digital Administrasi Pertanahan: Implementasi Dan Tantangan Sertipikat Elektronik Di Indonesia,” *Rio Law Jurnal* 6, no. 1 (2025): 499–507.

¹⁶ T B M Ferdiansyah Suryana et al., “Transformasi Digital Dalam Pelayanan Publik: Tinjauan Yuridis Terhadap SPBE Di Indonesia,” *Constitutio: Journal of State and Political Law Research* 4, no. 1 (2025): 37–53.

¹⁷ Adinegoro, “Analisis Transformasi Digital Layanan Publik Pertanahan : Hak Tanggungan Elektronik Pada Kementerian Agraria Dan Tata Ruang.”

¹⁸ Duma Indah Sari Lubis, Andi Hakim Lubis, and Rodiatun Adawiyah, “Reformasi Birokrasi Dalam Pengelolaan Pertanahan Nasional (Analisis Terhadap Implementasi Peraturan Presiden No. 177 Tahun 2024 Dalam Meningkatkan Efektivitas Dan Keadilan Sosial Di Indonesia),” *Law Jurnal* 5, no. 1 (2024): 45–57.

largely depends on the synergy between digital infrastructure development, the enhancement of institutional and community capacity, regulatory reform, and the application of good governance principles that ensure transparency and accountability in public services.

This transformation also serves as a response to public complaints regarding the complexity of conventional land services, which are often perceived as slow, convoluted, and costly, and frequently contradict the fundamental principles of land registration that emphasize simplicity, efficiency, and legal certainty.¹⁹ Through digitalization, land data management encompasses two main aspects: physical data (location, boundaries, and land area) and juridical data (legal status and ownership rights), both of which can now be managed in an integrated manner within an electronic system.²⁰ Electronic land certificates are even considered more secure than conventional ones, as they minimize the risk of document forgery and help prevent illegal land transactions perpetrated by land mafia networks.²¹

The implementation of this system has been carried out gradually through a series of activities, including public dissemination, the development and maintenance of electronic systems, the enhancement of human resource competencies, and the conversion of conventional juridical data into digital formats.²² However, this process continues to face several obstacles, including limited technological infrastructure, low public capacity, cybersecurity threats, digital literacy gaps, and issues

¹⁹ Adinegoro, “Analisis Transformasi Digital Layanan Publik Pertanahan : Hak Tanggungan Elektronik Pada Kementerian Agraria Dan Tata Ruang.”

²⁰ Adinegoro.

²¹ 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 (2024): 9.

²² Irwan Santosa and Endang Purwaningsih, “Analisis Pelaksanaan Transformasi Digital Sertifikat Tanah Di Era 4.0,” *Jurnal Surya Kencana Dua: Dinamika Masalah Hukum Dan Keadilan* 9, no. 1 (2022): 16–24.

related to personal data protection.²³ Nevertheless, public acceptance of electronic land certificates has been relatively positive, primarily due to their ability to enhance the efficiency, speed, and transparency of services.²⁴

Based on various previous studies, it can be concluded that the digital transformation of land services through the implementation of electronic land certificates and electronic mortgage registration represents a crucial step toward the modernization of agrarian bureaucracy in Indonesia. Halim et al. (2022) indicate that the main obstacles remain centered on technical aspects and inter-agency data synchronization.²⁵ Meanwhile, Santosa and Purwaningsih (2022) emphasize the need to improve public digital literacy and institutional readiness to ensure the effective implementation of electronic land certificates.²⁶ On the other hand, the innovation introduced by Maulana (2024) through an artificial intelligence (AI)-based monitoring system demonstrates a more advanced direction in maintaining data integrity and detecting potential violations by land mafia actors at an early stage. Collectively, these three studies indicate that the effectiveness of the electronic land administration system is determined not only by regulatory and technological instruments but also by the capacity of human resources, the organizational culture of the bureaucracy, and the readiness of society to embrace digital transformation.²⁷ Thus, further in-depth research is still required to examine the legal challenges and implications of implementing electronic land certificates, particularly in

²³ Adinegoro, “Analisis Transformasi Digital Layanan Publik Pertanahan : Hak Tanggungan Elektronik Pada Kementerian Agraria Dan Tata Ruang.”

²⁴ Santosa and Purwaningsih, “Analisis Pelaksanaan Transformasi Digital Sertifikat Tanah Di Era 4.0.”

²⁵ Halim et al., “Pelaksanaan Pendaftaran Hak Tanggungan Secara Elektronik.”

²⁶ Santosa and Purwaningsih, “Analisis Pelaksanaan Transformasi Digital Sertifikat Tanah Di Era 4.0.”

²⁷ Maulana et al., “Urgensi Sertifikat Elektronik Dengan Pemantauan Berbasis AI Untuk Efisiensi Pendaftaran Tanah Dan Mitigasi Mafia Tanah Di Indonesia.”

the context of mortgage registration, to ensure that the system can provide legal certainty, administrative efficiency, and the protection of land rights in the era of digital transformation.

II. Method

This study employs a normative juridical method, focusing on the examination of positive legal norms that regulate the implementation of electronic-based land administration services in Indonesia. This approach is used to analyze the legal basis, principles, and application of regulations related to the Electronic Mortgage (HT-el) and the conversion of physical land certificates into electronic form as part of the digital transformation policy implemented by the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN).

The object of this research includes various legal instruments that serve as the foundation for the implementation of the electronic land administration system, among them: Regulation of the Minister of Agrarian Affairs and Spatial Planning/Head of the National Land Agency No. 5 of 2020 concerning Integrated Electronic Mortgage Services; Regulation of the Minister of ATR/BPN No. 3 of 2023 concerning the Issuance of Electronic Documents in Land Registration; Law No. 4 of 1996 on Mortgage Rights over Land and Objects Related to Land; and Government Regulation No. 24 of 1997 on Land Registration. The analysis aims to assess the consistency among these regulations, the clarity of their legal norms, and the effectiveness of their implementation in supporting the modernization of land administration services.

The legal materials used in this study consist of primary sources, including legislation and official documents issued by ATR/BPN; secondary sources, such as literature, previous research findings, and

relevant scholarly articles; and tertiary sources, such as legal dictionaries and encyclopedias that help clarify the legal concepts discussed.

The legal materials are analyzed qualitatively using a deductive approach, beginning with the elaboration of general legal norms and proceeding to specific issues in the implementation of electronic mortgage registration. Through this method, the study seeks to identify the extent to which Indonesia's electronic land administration system has ensured legal certainty, the validity of electronic documents, and legal protection for the parties involved in the implementation of digital land services.

III. Challenges of Electronic Mortgage Registration in Indonesia's Land Administration Reform

The implementation of the Electronic Mortgage (HT-el) registration system in Indonesia marks a new phase in the reform of national land administration, as regulated under the Regulation of the Minister of Agrarian Affairs and Spatial Planning/Head of the National Land Agency (BPN) No. 3 of 2023. The transition from a manual to a digital system represents not only a form of technical modernization but also a fundamental shift in the functioning of law and public administration. This system carries a major mission: to create efficiency, accelerate service delivery, reduce data overlap, and prevent document forgery long-standing issues that have plagued Indonesia's land governance.²⁸

²⁸ Adinegoro, "Analisis Transformasi Digital Layanan Publik Pertanahan : Hak Tanggungan Elektronik Pada Kementerian Agraria Dan Tata Ruang"; Tabah Riyanto, Suardi Suardi, and Abraham Martin, "Tinjauan Yuridis Pelaksanaan Pendaftaran Tanah Secara Elektronik Berdasarkan Peraturan Menteri Agraria Dan Tata Ruang/Kepala Badan Pertanahan Nasional Republik Indonesia Nomor 3 Tahun 2023 Tentang Penerbitan Dokumen Elektronik Dalam Kegiatan

However, as with other major transformations in the fields of law and governance, the implementation of the HT-el system is not without structural, cultural, and technological challenges that affect its overall effectiveness and legitimacy.

The HT-el system is essentially designed to streamline the registration of mortgage rights, reinforce legal certainty, and enhance transparency in public administration. Under this system, every stage of the registration process from the preparation of the Deed of Granting Mortgage Rights (APHT) to the issuance of the mortgage certificate is conducted electronically through a platform fully integrated with the National Land Agency (BPN) database.²⁹ Land Deed Officials (PPAT) play a crucial role in the initial stage of this process by verifying the authenticity of certificate data, preparing the Deed of Granting Mortgage Rights (APHT), and uploading the relevant documents to the system. Meanwhile, the creditor is responsible for submitting the registration application and paying the prescribed fees online. Each uploaded document must be accompanied by an accountability statement from the PPAT to ensure its electronic validity. However, when the submitted data are inconsistent, the system automatically rejects the application.³⁰ This mechanism, on the one hand, establishes a stringent legal filter, but on the other hand, it also opens up room for debate regarding legal responsibility in cases of technical errors or data entry mistakes committed by system users.

From a legal responsibility perspective, studies suggest that errors occurring in electronic certificates are predominantly linked to the

Pendaftaran T,” *Postulat* 3, no. 1 (February 8, 2025): 35–48, <https://doi.org/10.37010/postulat.v3i1.1843>.

²⁹ Sounda Daniawijaya and Budi Ispriyarso, “Tanggung Jawab Kreditor Dan PPAT Dalam Pelaksanaan Pendaftaran Hak Tanggungan Secara Elektronik,” *Notarius* 17, no. 1 (2022): 565–77.

³⁰ Shirley Zerlinda Anggraeni and Marwanto Marwanto, “Kewenangan Dan Tanggung Jawab Hukum Pejabat Pembuat Akta Tanah Dalam Pelaksanaan Pendaftaran Hak Tanggungan Secara Elektronik” (Udayana University, 2020).

creditor's role as the data-inputting party, while the PPAT bears responsibility only for the authenticity and validity of the submitted documents.³¹ Nonetheless, the role of the PPAT remains exposed to risk, as the system obliges them to sign a declaration of responsibility for the authenticity of electronic files. This tension illustrates that digitalization does not necessarily simplify accountability; instead, it may further complicate it in the absence of a well-defined legal framework governing the allocation of risks and administrative errors. When the system automatically rejects a file due to technical malfunctions or data inconsistencies, the parties involved frequently encounter legal uncertainty over who should ultimately bear responsibility for the resulting administrative failure.

Furthermore, the implementation of the HT-el system across various regions reveals considerable disparities in readiness. Research conducted at the Pekanbaru Land Office, for instance, indicates that the HT-el system has not yet been fully operational in accordance with established procedures, as obstacles remain in account registration, technical difficulties during the data upload process, and issues related to information validation.³² Many users, both from the PPAT and the banking sector, are still unfamiliar with the procedures for entering digital data, which often leads to input errors and subsequent delays in processing. In addition, network disruptions and system failures have become recurring obstacles that slow down the overall registration workflow.³³ This condition illustrates that the readiness of technological

³¹ Pradesti Elva Rachmayanti and Ngadino Ngadino, "Peran Dan Tanggung Jawab PPAT Dalam Penerbitan Sertifikat Hak Tanggungan Elektronik," *Notarius* 15, no. 1 (2022): 230–40.

³² Krisnawan Andiyanto, Dian Aries Mujiburohman, and Haryo Budhiawan, "Penerapan Pendaftaran Hak Tanggungan Terintegrasi Secara Elektronik Di Kantor Pertanahan Kota Pekanbaru," *Acta Comitas: Jurnal Hukum Kenotariatan* 6, no. 1 (2021): 198–210.

³³ Ni Nyoman Mariadi and I Komang Kawi Arta, "Efektivitas Pengurusan Hak Tanggungan Elektronik Di Kantor Pertanahan Kabupaten Buleleng," *Jurnal Penelitian Dan Pengembangan Sains Dan Humaniora* 5, no. 3 (2021): 423–34.

infrastructure remains a fundamental weakness in the implementation of the digital land administration system.

Such infrastructural limitations exacerbate the gap between urban and rural areas in accessing electronic land services. Regions with weak internet connectivity or limited technological resources face a dual burden: technical incapacity to access the system and administrative lag in public service delivery.³⁴ In this regard, the anticipated efficiency gains of digital transformation risk deepening service inequalities if not matched by equitable access. Hence, the digitalization of the HT-el system necessitates affirmative policy measures such as expanding digital infrastructure in rural areas, establishing offline-to-online service mechanisms, and providing public training programs to prevent legal exclusion among technologically marginalized groups. Absent such interventions, the modernization of land administration law may ultimately benefit only those segments of society already equipped with technological access.

Beyond technical and infrastructural constraints, cybersecurity and personal data protection pose significant challenges to the implementation of the HT-el system. Electronic land registration processes handle highly sensitive information ranging from ownership identities and mortgage values to land locations and legal statuses. Any vulnerability to data breaches or cyberattacks could directly compromise asset security and erode public institutional credibility. Although the BPN system employs multi-layer authentication and digital signature mechanisms, the threat of data manipulation remains if internal monitoring and control are not rigorously maintained.³⁵ Data protection within the HT-el system must be synchronized with national

³⁴ Muhammad Japar et al., "Analisis Kesiapan Masyarakat Dalam Pelaksanaan Program Sertifikasi Tanah Secara Elektronik: Suatu Tinjauan Sosiologi Hukum," *Rechtsregel: Jurnal Ilmu Hukum* 7, no. 1 (2024): 81–90, <https://doi.org/https://doi.org/10.32493/rjih.v7i1.43502>.

³⁵ Adinegoro, "Analisis Transformasi Digital Layanan Publik Pertanahan : Hak Tanggungan Elektronik Pada Kementerian Agraria Dan Tata Ruang."

policies on privacy and information security, ensuring that citizens are guaranteed not only digital storage of their data but also legal and ethical protection.

The transformation toward a digital system also demands a paradigm shift in understanding the law itself. Digitalization does not merely convert documents from physical to electronic form but also transforms the legal framework from a text-based system into one governed by systems and algorithms. Land law, which has traditionally been perceived as a closed and rigid structure, must now interact with the adaptive and open logic of technology.³⁶ Public Notaries and Land Deed Officials (PPAT) and National Land Agency (BPN) apparatus need to understand how databases work, digital signatures, and encryption procedures as part of a new legal knowledge. Thus, legal education and training can no longer stop at mastering regulations but must also include legal digital literacy as a professional competence. This process is a social learning where the law is forced to evolve to remain relevant with technological changes.

The socio-economic context of Indonesian society further complicates the implementation of this system. Not all right-holders or debtors possess the adequate economic capability and technological literacy to follow electronic procedures. People in rural areas often still have more faith in physical documents that they can store concretely, while electronic certificates are viewed as abstract and invisible. This skepticism creates cultural resistance towards digital registration.³⁷ Under these conditions, the state must be present with an educational and participatory approach, not merely instructing the public to follow the new system, but also explaining the benefits, mechanisms, and legal guarantees behind it. Community-based digital literacy programs are

³⁶ Adinegoro.

³⁷ Japar et al., "Analisis Kesiapan Masyarakat Dalam Pelaksanaan Program Sertifikasi Tanah Secara Elektronik: Suatu Tinjauan Sosiologi Hukum."

essential to ensure that this legal transformation does not create new social exclusion amid the still high digital divide.

From an institutional perspective, the success of electronic Land Rights (HT-el) highly depends on the readiness of the implementing institutions, particularly the BPN (National Land Agency) and PPAT (Public Notaries and Land Deed Officials). This new system demands an adaptive, open, and accountable bureaucracy. However, in reality, many apparatus still lack the technical capability to effectively operate the system. A work culture still oriented towards manual procedures further slows down adaptation.³⁸ Administrative reform in land administration through digitalization will only be meaningful if accompanied by a reform of the bureaucratic work culture. Technical training, human resource capacity building, and a supervision system based on public transparency must be prioritized. The BPN (National Land Agency) needs to establish an online monitoring mechanism that allows the registration process to be openly audited by the public to increase community trust in electronic land services.

Administrative reform in land administration through digitalization will only be meaningful if accompanied by a reform of the bureaucratic work culture. Technical training, human resource capacity building, and a supervision system based on public transparency must be prioritized. The BPN (National Land Agency) needs to establish an online monitoring mechanism that allows the registration process to be openly audited by the public to increase community trust in electronic land services.

Despite being marked by various constraints, electronic Land Rights (HT-el) still carry significant potential to strengthen legal certainty and administrative efficiency. The electronic certificate possesses valid evidentiary power and can be used as a tool for legal

³⁸ Mariadi and Arta, "Efektivitas Pengurusan Hak Tanggungan Elektronik Di Kantor Pertanahan Kabupaten Buleleng."

execution in court.³⁹ This advantage indicates that, normatively, the system has been designed to accommodate modern legal needs. However, a challenge arises when the judiciary is not yet fully prepared to handle electronic evidence. There is a need to strengthen the capacity of judges and law enforcement officials in understanding the mechanisms of digital authentication, timestamping, and the validity of electronic signatures so that the process of evidence in court does not lead to contradictory interpretations. A judiciary that is adaptive to technology will strengthen the legitimacy of electronic Land Rights (HT-el) as a legal instrument equivalent to physical documents.

Furthermore, the digitalization of encumbrance rights (hak tanggungan) also affects the dynamics of the credit market in Indonesia. With faster procedures and more accurate data, the process of granting credit secured by land can become more efficient. However, during the initial implementation phase, an unstable system actually poses additional risks for financial institutions. Data errors or delays in the issuance of electronic certificates can impede credit disbursement and result in financial losses. Therefore, synergy between agrarian regulators and financial authorities is crucial to ensure that the digitalization of certificates does not, in fact, magnify the risks of economic transactions.⁴⁰ System integration across institutions is also necessary so that land data can be directly used in the credit verification process without adding administrative burden.

³⁹ Gratia Ariefa, "Tinjauan Yuridis Sertifikat Hak Tanggungan Yang Di Terbitkan Melalui Sistem Elektronik Menurut Peraturan Menteri Agraria Dan Tata Ruang/Kepala Badan Pertanahan Nasional No. 5 Tahun 2020 Tentang Pelayanan Hak Tanggungan Terintegrasi Secara Elektronik," *Jurnal Perspektif Hukum* 3, no. 1 (2022): 81–91.

⁴⁰ Jefri Guntoro, Emelia Kontesa, and Herawan Sauni, "Tinjauan Yuridis Pendaftaran Hak Tanggungan Dalam Pelayanan Hak Tanggungan Terintegrasi Secara Elektronik," *Bengkoclen Justice: Jurnal Ilmu Hukum* 10, no. 2 (2020): 212–25.

Throughout this process, social justice must remain the moral foundation of reform. Land digitalization should not be interpreted merely as administrative efficiency but also as an effort to broaden public access to legal certainty regarding land rights. The state must ensure that technological innovations do not marginalize vulnerable groups who have historically faced difficulties in accessing formal legal services. The principle of inclusivity should serve as the guiding spirit of every reform initiative, so that digital transformation aligns with the constitutional mandate to realize welfare and social justice for all Indonesians. Consequently, the registration of electronic mortgages (HT-el) should not be viewed merely as an administrative instrument but also as a manifestation of the state's commitment to transparent, equitable, and participatory public service.

Ultimately, electronic mortgage registration is not merely an administrative digitization project but a legal learning process that integrates norms, technology, and professional ethics into a unified system. Through the direct involvement of stakeholders—PPAT (Land Deed Officials), creditors, and BPN (National Land Agency) officers—a new awareness emerges regarding how law operates within a digital ecosystem. The challenges presented by this system open avenues for methodological innovation in legal studies. Legal understanding, which has traditionally focused on textual regulations, is now tested and enriched through hands-on engagement with technological issues in the field. In other words, HT-el serves as a living laboratory for legal science development in the digital era, where legal professionals must not only comprehend norms but also navigate the complexities of data, systems, and algorithms.

Electronic Mortgage Registration (HT-el) is not merely a form of document digitization; it constitutes an institutional experiment testing the extent to which law can interact effectively with technology. The complexity of challenges spans technical, legal, social, and ethical dimensions, all of which are interrelated and demand institutional

preparedness. Behind the risks lie significant opportunities, including enhanced legal certainty, faster service access, and expanded financial inclusion, provided implementation follows a holistic approach that places humans at the center of policy. Meaningful land administration reform does not only replace conventional tools with digital systems but also revitalizes institutional governance, strengthens the capacities of PPAT and BPN officers, and ensures equitable access for all societal layers. Therefore, HT-el should be considered a collective learning process that integrates adaptive regulations, secure technology, and policies oriented toward social justice, ensuring that digital transformation strengthens, rather than undermines, the rule of law in the agrarian sector.

Land administration reform through the HT-el system will only be meaningful if executed with a balance between technological innovation and legal justice. Its success depends on four key aspects: regulatory strengthening, human resource capacity building, equitable digital infrastructure, and active public participation. Several concrete measures should be implemented, including strategic investment in national infrastructure and reliable BPN servers; tiered training programs for PPAT, BPN staff, and creditor operators; establishing clear legal frameworks for responsibility allocation and dispute resolution mechanisms; and implementing encryption-based security and privacy systems with audit logs. Additionally, an inclusive approach should be adopted, including offline registration options in areas with limited internet access, digital literacy programs for vulnerable groups, and independent audits to ensure public transparency. Cross-sector collaboration among BPN, relevant ministries, financial institutions, professional associations, and civil society organizations is essential to ensure that HT-el implementation is not only administratively efficient but also just, transparent, and capable of strengthening public trust in the national agrarian legal system.

IV. Government Policy in Implementing Land Registration Program under Government Regulation No. 18 of 2021

The transition from physical land certificates to electronic land certificates in Indonesia marks a paradigm shift in land administration, encompassing normative, administrative, and social dimensions. The digitization of certificates not only modernizes registration procedures but also carries complex legal implications, particularly concerning evidentiary issues, public officials' responsibilities, and personal data protection. Substantively, electronic certificates hold the same legal status as physical certificates as proof of land ownership. However, several empirical studies and legal literature highlight a gap between legal recognition and practical acceptance in courts. Bahori Ahoen notes a "critical disjunction between its substantive recognition as valid evidence of rights and the procedural void in the Civil Procedure Code (HIR/RBg)".⁴¹ This statement emphasizes that although electronic certificates are legally recognized as proof of ownership, their authentication mechanisms have not yet been fully integrated into the procedural law framework in Indonesia. This is further reinforced by Sahat Sinaga et al., who note that electronic certificates are "in the process of being accepted as valid evidence in courts," yet their level of acceptance remains limited.⁴² This situation highlights the need for procedural law reform to accommodate electronic evidence, ensuring legal certainty and minimizing potential disputes. The gap is not only

⁴¹ Bahori Ahoen, "Analisis Kekuatan, Kerentanan, Dan Tantangan Pembuktian Sertifikat Tanah Elektronik Di Indonesia," *Jurnal Locus Penelitian Dan Pengabdian* 4, no. 9 (2025): 8414–28.

⁴² Sahat Hangoluan Maruli Tua Sinaga, "Kehadiran Sertipikat Tanah Elektronik Dalam Perkembangan Hukum Pembuktian Sebagai Dampak Kemajuan Teknologi Informasi Dan Komunikasi," *Jurnal Hukum To-Ra: Hukum Untuk Mengatur Dan Melindungi Masyarakat* 11, no. 2 (2025): 478–97.

normative but also practical. Several empirical studies conducted between 2021 and 2025 indicate that the implementation of electronic certificates faces significant challenges. Desi Nurwiyanti et al. emphasize the unclear allocation of responsibilities between Land Deed Officials (PPAT) and the National Land Agency (BPN) regarding the verification of certificate authenticity.⁴³ This lack of clarity has the potential to trigger legal disputes if the electronic data recorded in the system does not correspond to the actual conditions in the field. Furthermore, limitations in technical infrastructure, including validation systems and database integration, directly affect the reliability of electronic certificates.⁴⁴ Inadequate infrastructure not only creates the risk of administrative errors but also has the potential to trigger legal disputes, as digital data serves as the basis for proving ownership rights.

In the context of public officials' responsibilities, the digitization of land certificates entails broader legal consequences compared to physical certificates. Heads of Land Offices and Land Deed Officials (PPAT) are now accountable not only for administrative aspects but also for the accuracy of the electronic data they manage. Data entry errors, negligence in document verification, or system failures may result in land ownership disputes, which in turn could lead to administrative lawsuits. Law Number 30 of 2014 on Government Administration emphasizes that public officials are obliged to act with caution, professionalism, and transparency in every decision that affects citizens' rights.⁴⁵ Therefore, the accountability mechanisms for public officials must be expanded to encompass negligence in managing electronic data, not limited to manual errors. The concept of digital negligence becomes crucial to ensure that public officials are held responsible for the legal

⁴³ Desi Nurwiyanti, "Keabsahan Validitas Data Hasil Pengecekan Sertipikat Elektronik Dan Pengecekan Langsung," *Otentik's: Jurnal Hukum Kenotariatan* 3, no. 2 (2021): 123–37.

⁴⁴ Habibi et al., "Transformasi Digital Administrasi Pertanahan: Implementasi Dan Tantangan Sertipikat Elektronik Di Indonesia."

⁴⁵ Law No. 30 of 2014 concerning Government Administration, Article 6

consequences arising from mismanagement of digital land data, including administrative liability and the potential for criminal responsibility if such negligence results in significant harm to the public.

The aspect of personal data protection also constitutes a crucial legal issue in this transition. Electronic land certificates store sensitive information, including the owner's identity, National Identification Number, address, and land coordinates. Under Law Number 27 of 2022 on Personal Data Protection, such data is categorized as critical personal data that must be kept confidential.⁴⁶ As the data controller, the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) has a legal obligation to ensure the security and confidentiality of information, as well as to implement the principles of integrity, confidentiality, and accountability. Data breaches or misuse can lead to administrative and criminal liability and undermine the legitimacy of the electronic certificate system in the public's perception. Therefore, information security is not merely a technical issue but also serves as a legal foundation to maintain public trust in the digital land administration system.

Moreover, electronic certificates play a strategic role in preventing illegal practices in the land sector. With a more secure digital mechanism, the risk of certificate forgery is reduced, and the potential for intervention by parties exploiting weaknesses in the physical system, such as land mafias, can be minimized. However, digitalization also introduces new forms of disputes, such as data entry errors, system disruptions, or discrepancies between physical and digital records, which require verification through digital forensic evidence, including system logs and audit trails.⁴⁷ Legal challenges arise when regulations on electronic certificates do not fully reference the Basic Agrarian Law,

⁴⁶ Law No. 27 of 2022 concerning Personal Data Protection, Article 1 paragraph (1)

⁴⁷ Faris Faza Ghaniyyu, Yani Pujiwati, and Betty Rubiati, "Jaminan Kepastian Hukum Konversi Sertipikat Menjadi Elektronik Serta Perlindungannya Sebagai Alat Pembuktian," *Jurnal USM Law Review* 5, no. 1 (2022): 172–87.

resulting in diverse interpretations regarding the validity of electronic certificates and the dual registration system.⁴⁸ Legal certainty for rights holders heavily depends on the maintenance of accurate data, whereby electronic certificates can serve as valid evidence through direct system display or official printed outputs.

The transition to electronic certificates also affects the protection of third parties in land transactions. In sales, grants, or inheritance, third parties now rely on the validity of electronic data within the BPN system. If the system is disrupted or manipulated, third-party rights may be lost without their knowledge, creating an urgent need for backup mechanisms, transparent digital audits, and accountable data validation procedures.⁴⁹ Translation:

The electronic certificate must be independently accessible without reliance on a specific official to ensure the principle of procedural justice is maintained. This situation confirms a shift in the legal paradigm from physical evidence to systemic evidence, where legal certainty no longer solely depends on the form of the document but on the integrity and reliability of the system managing the land data.

Normatively, the digitalization of land certificates brings a fundamental change in the structure of legal proof. Proof of land ownership no longer rests solely on physical documents but on a validated electronic system. Administratively, the responsibility of public officials and PPATs becomes more complex as they must maintain data accuracy and security in the digital context. Socially, digitalization introduces new challenges related to accessibility and the digital divide, which can affect legal justice, especially for communities with limited access to technology. Therefore, land digitalization is not

⁴⁸ Dwi Wulan Titik Andari and Dian Aries Mujiburohman, "Aspek Hukum Layanan Sertifikat Tanah Elektronik," *Al-Adl: Jurnal Hukum* 15, no. 1 (2023): 154–70.

⁴⁹ Dewi Padusi Daeng Muri, Erna Sri Wibawanti, and Manda Ika Safitri, "Sertipikat Elektronik Sebagai Jaminan Perlindungan Hak Atas Tanah Dalam Pelaksanaan Pendaftaran Tanah," *Jurnal USM Law Review* 8, no. 2 (2025): 1126–47.

just an administrative innovation; it is a legal transformation demanding comprehensive adaptation across the system, regulations, and public legal awareness.

Beyond internal legal aspects, the digitalization of land certificates necessitates integration between agrarian law, state administrative law, and information technology law. A clear legal framework must guarantee the validity of electronic certificates in court proceedings, the protection of right-holders' rights, and the security of personal data as part of citizens' human rights. The duality of the registration system (physical and electronic) creates the potential for legal uncertainty, which can only be overcome through firm regulation, transparent digital audit mechanisms, and standard verification procedures. In this regard, the law acts as a mediator between technology and public interest, so that the digitalization of land certificates does not inadvertently lead to new disputes.

Furthermore, the digitalization of land certificates opens opportunities for strengthening legal supervision. Digital audit mechanisms, system logs, and access trails can be used as tools to systematically trace errors or data manipulation. From an administrative law perspective, this reinforces the accountability of public officials and PPATs, as every action or data input can be tracked electronically. Additionally, regulations related to electronic certificates need to mandate digital certification and electronic signatures for every transaction, thereby maintaining document validity and ensuring legal protection for third parties.⁵⁰

Overall, the legal implications of the transition from physical to electronic certificates are multidimensional. Normatively, there is a fundamental change in the structure of legal proof and validity. Administratively, new responsibilities arise for public officials and PPATs in maintaining data accuracy and security. Socially, there are

⁵⁰ Masri and Hirwansyah, "Kebijakan Penerbitan Sertipikat Elektronik Pada Sistem Pendaftaran Tanah Di Indonesia Untuk Mewujudkan Kepastian Hukum."

challenges related to accessibility and the digital divide that can affect legal justice. This transformation confirms that land digitalization is not just a technological or administrative innovation, but a legal transformation that demands systemic reform, increased professionalism of public officials, and strengthening of regulatory mechanisms to ensure efficient, transparent, and just land governance.

Thus, the digitalization of land certificates opens up both significant opportunities and challenges for the Indonesian land law system. The success of its implementation is measured not only by system efficiency or technical security, but also by the extent to which the law is able to provide legal certainty, protect the rights of landowners, and maintain justice for all parties involved. The integration of technology, regulation, and the professionalism of state apparatus becomes a key factor in ensuring that the digitalization of land certificates provides tangible and sustainable legal benefits for society.

V. Conclusion

The digital transformation of land administration through the Electronic Mortgage (HT-el) service represents a significant milestone in the modernization of agrarian law in Indonesia. This study concludes that, although the HT-el system can enhance efficiency, transparency, and data security, its implementation still faces challenges such as uneven digital infrastructure, limited capacity of officials, and overlapping legal responsibilities among institutions. Regulatory inconsistencies also generate potential administrative disputes that may undermine legal certainty.

To ensure the sustainability of the digital land system, four key strategies are required: (1) harmonization of regulations on electronic land registration and digital certificates; (2) strengthening cybersecurity and personal data protection; (3) enhancing the technical competencies of Land Deed Officials (PPAT) and BPN staff; and (4) expanding

inclusive access for communities with technological limitations. The digitization of mortgages is not solely aimed at simplifying administrative procedures but must also guarantee fairness, equality, and public trust in national land governance. By integrating legal, technological, and social dimensions, this reform is expected to serve as a model for other developing countries in achieving effective and equitable e-government–based land administration.

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