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# Electronic Land Certificates: A Breakthrough in Digital Transformation or a New Challenge to Legal Certainty

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## Abstract

Digital transformation in the legal sector has become inevitable, including in Indonesia's agrarian governance system through the implementation of electronic land certificates. Nevertheless, the transition from conventional land certificates to digital documents also generates challenges related to legal certainty and public trust toward digital governance. This article aims to analyze whether electronic land certificates represent a genuine digital breakthrough or instead create new legal and social vulnerabilities. This study employs a qualitative approach through analytical methods and secondary data observation. The findings demonstrate that the success of electronic land certificates is not solely determined by technological sophistication, but also by regulatory readiness, institutional accountability, cybersecurity protection, and the level of public digital literacy. The study further reveals that community

resistance and fearfulness remain significant due to concerns regarding cyberattacks, misuse of personal data, inequality in digital infrastructure, and the declining symbolic legitimacy of physical land certificates within agrarian culture. This study suggest that the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) strengthen transparent governance mechanisms, improve public participation, and establish adaptive legal standards concerning digital evidence and electronic land administration. In addition, the Ministry of Communication and Digital Affairs should reinforce cybersecurity infrastructure, expand equitable internet access, and formulate stronger personal data protection frameworks to ensure that the digital transformation of Indonesia's land system remains legally secure, socially accepted, and institutionally sustainable.

**KEYWORDS** *Electronic Land Certificates, Digital Transformation, Legal Certainty, Agrarian Regulation, Cybersecurity.*

# Introduction

Digital transformation in the land sector represents a new direction in national legal policy in response to the era of public administration digitalization.[1] The Indonesian government, through Government Regulation Number 18 of 2021 concerning Management Rights, Land Rights, Apartment Units, and Land Registration, as well as Regulation of the Minister of Agrarian Affairs and Spatial Planning/Head of the National Land Agency Number 1 of 2021 concerning Electronic Certificates as revoked by Regulation of the Minister of Agrarian Affairs and Spatial Planning/Head of the National Land Agency Number 3 of 2023 concerning the Issuance of Electronic Documents in Land Registration Activities, affirms the state's determination to transform land management into an integrated digital data-based system. The goal is clear: to accelerate public services, curb land mafia practices, and strengthen legal certainty over property rights. Through this regulation, land certificates, which for decades have been physical documents stamped with the official seal of the

[1] Vita Tkachenko, Yurii Kotviakovskyi, and Svitlana Zinchenko, "Contemporary European Concepts of Public Administration in The Context of Digital Transformation And Their Legal Framework," *Public Administration and Law Review*, no. 1(21) (March 2025): 99–109, https://doi.org/10.36690/2674-5216-2025-1-99-109.

state, are being transformed into electronic documents with digital signatures that have equal legal force. This policy reflects efforts to modernize land administration law in line with the spirit of good governance and the principle of bureaucratic efficiency. However, this legal modernization does not only concern changes in the form of documents, but also changes in the legal paradigm itself, namely from physical-based law to data-based law. These changes have profound implications for the principles of evidence, public trust, and the legitimacy of Indonesian agrarian law.[2]

Although land certificate digitization is normatively viewed as a progressive step, in social reality serious problems have arisen that highlight the gap between the idealism of the regulation and the reality of its implementation. One of the main problems is the digital divide, which has resulted in some communities, especially in rural areas, being unable to access electronic land services. Amidst limited digital infrastructure, poor internet connectivity, and low technological capacity among the community, the implementation of the electronic certificate system faces considerable social resistance.[3] For people who are accustomed to physical systems, land certificates are not merely administrative documents, but authentic symbols of ownership that have psychological, social, and economic value. The loss of physical form is considered a loss of "concrete evidence" of ownership, even though digital certificates have the same legal force.

Based on the survey results conducted by Jagadhita, it was found that physical certificates are still considered to provide a greater sense of security and ownership certainty compared to digital documents. Concerns about data forgery, system hacking, and privacy threats also dominate the issues affecting public trust in the implementation of digital certificates. Then, the importance of cybersecurity guaranties, personal data protection, and more intensive socialization from the relevant institutions. In addition, the limitations of digital literacy, the lack of technical understanding among rural communities, and the constraints of internet connectivity and technological devices pose structural

[2] Christos Karagiannis and Kostas Vergidis, "Digital Evidence and Cloud Forensics: Contemporary Legal Challenges and the Power of Disposal," *Information* 12, no. 5 (April 2021): 181, https://doi.org/10.3390/info12050181.

[3] Faishal Amroe Hidayat and Ana Silviana Silvie, "Analysis of the Regulation of Electronic Land Certificates in the Regulation of the Minister of Agrarian and Spatial Planning/Head of the National Land Agency Number 3 of 2023 Concerning the Issuance of Electronic Documents," *Jurnal Meta-Yuridis* 8, no. 1 (March 2025): 23–28, https://doi.org/10.26877/m-y.v8i1.20250.

obstacles in the process of digital land transformation.[4] On the other hand, low digital legal literacy makes the community vulnerable to procedural errors, data misuse, and technology-based fraud. This phenomenon creates an irony: on the one hand, the state is trying to create efficiency through digitalization, but on the other hand, it opens up new opportunities for legal uncertainty and injustice for groups of people who are not yet technologically ready.

In addition to disparities in access and literacy, there is also an epistemological problem in the legal system, namely the extent to which agrarian law, which is rooted in civil law tradition, can adapt to digital electronic evidence. In the Indonesian legal system, physical documents with official signatures and stamps are still considered the main form of evidence in civil cases, especially those relating to land ownership rights. The shift to digital forms challenges the classic concept of evidence law, which emphasizes written evidence as a means of formal legitimization.[5] Electronic certificates raise new questions about the legal validity of documents that cannot be seen or touched directly.[6] Critical questions arise: how does the legal system assess the validity of digital signatures, data authentication mechanisms, and the process of verifying electronic certificates in the context of legal disputes? Does the judicial system already have the capacity and clear guidelines to assess electronic evidence in agrarian cases? These questions reveal an urgent need to reexamine the extent to which existing legal norms are capable of accommodating the new dynamics presented by digital technology.

The issue of electronic certificates, in a broader social context, is also closely related to the crisis of public trust in the land legal system. Cases of land overlapping, land mafia, and bureaucratic corruption have eroded the legitimacy of agrarian law in the eyes of the public.[7] The implementation of a digital system is expected to be a solution, but without strengthening security and

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4 Mochammad Abyan Jagadhita, "Transformasi Digital Sertifikat Tanah Dan Respons Masyarakat Terhadap Penerapannya," *JURNAL USM LAW REVIEW* 8, no. 3 (October 2025): 1600–1620, https://doi.org/10.26623/julr.v8i3.12448.

5 Elena Alina Ontanu, "Normalising the Use of Electronic Evidence: Bringing Technology Use into a Familiar Normative Path in Civil Procedure," *Oñati Socio-Legal Series* 12, no. 3 (June 2022): 582–613, España, Internacional, https://doi.org/10.35295/osls.iisl/0000-0000-0000-1304.

6 Sopia Nopitasari Rahim et al., "Legal Implications of the Use of Digitalization of Online Land Registration," *Path of Science* 10, no. 5 (May 2024): 2011–18, https://doi.org/10.22178/pos.104-12.

7 Arya Hafiddin et al., "Legal Consequences of Issuing Electronic Land Certificates and Their Legal Force Based on The Regulation of The Minister of Agrarian and Spatial Planning / Head of The National Land Agency of The Republic of Indonesia Number 3 Of 2023," *Jurnal Darma Agung* 32, no. 4 (September 2024): 461–71, https://doi.org/10.46930/ojsuda.v32i4.4410.

transparency, it has the potential to raise new suspicions. Public concerns about data leaks, hacking, and the possibility of system manipulation weaken trust in state legal authorities. This situation presents the law with a double challenge: on the one hand, it must ensure that technological innovation runs effectively, but on the other hand, it must ensure that justice and legal protection are not eroded by the rationality of digital efficiency. In other words, the success of electronic land certificates cannot be measured solely from a technical or administrative perspective, but also from the level of social trust in the digital legal system itself.[8]

Based on these issues, the main problem formulation that forms the core of this research is: how does the innovation of electronic land certificates affect community practices and trust in the land system in Indonesia? This question requires a study that goes beyond the boundaries of written law (law in books) to the reality of living law (law in action). Therefore, this study uses an observational approach, which combines normative legal analysis with a sociological understanding of community practices and perceptions by using data from surveys or research conducted by previous researchers. This approach views law not only as a system of norms, but also as a social product and instrument that is influenced by cultural, economic, and technological contexts. Through this approach, the study will explore not only how the law regulates the digitization of land certificates, but also how the community accepts, rejects, or negotiates the meaning of digital law in everyday life. Methodologically, this approach allows researchers to identify the dialectical relationship between regulation and social practice between rule-making by the state and rule-following by the community.[9]

In an effort to build a strong theoretical foundation, this study refers to a number of relevant previous studies. Latupeirissa et al. (2024) in his study emphasizes that the digitization of land certificates can strengthen bureaucratic integrity and public service efficiency, but its success is highly dependent on the readiness of the national digital infrastructure.[10] Djuraev et al. (2025) highlight

[8] Bambang Yudianto and Faisal Santiago, "Legal Certainty Regarding the Existence of Electronic Certificates Based on Welfare State Principles," *Journal of Multidisciplinary Sustainability Asean* 1, no. 6 (December 2024): 437–50, https://doi.org/10.70177/ijmsa.v1i6.1830.

[9] Agung Wibawa and Lego Karjoko, "Realizing World-Standard's Spatial Planning and Land Management: The Urgency of Bureaucratic Reform," February 22, 2024, 346–53, https://doi.org/10.2991/978-2-38476-218-7_58.

[10] Jonathan Jacob Paul Latupeirissa et al., "Transforming Public Service Delivery: A Comprehensive Review of Digitization Initiatives," *Sustainability* 16, no. 7 (March 2024): 2818, https://doi.org/10.3390/su16072818.

community resistance to electronic certificates caused by low levels of legal and technological literacy at the local level, as well as the incompatibility between the digital legal system and the social practices of agrarian communities.[11] Meanwhile, Fuad et al. (2023) shows that there is potential for disharmony between conventional agrarian legal norms and new norms that have emerged in the digital context, especially in terms of evidence and data protection.[12] In the international context, Allen et al. (2025), through a study of the Singapore Land Authority, emphasize the importance of trust architecture, which is a framework of trust that combines technological security, regulatory transparency, and public participation in the oversight of digital systems.[13] Previous studies have substantially examined the relationship between land certificate digitalization, legal adaptation, technological readiness, and public trust. However, these studies have not specifically analyzed whether electronic land certificates in Indonesia genuinely represent a transformative digital breakthrough or merely reproduce new forms of legal uncertainty, technological vulnerability, and social distrust. The existing literature also lacks an integrative socio-legal analysis regarding the interaction between digital governance, agrarian culture, cybersecurity risks, and public perceptions of legitimacy, particularly within Indonesia's diverse socio-cultural and infrastructural conditions.

This study aims to identify the gap between innovation and regulation in the implementation of electronic land certificates. On the one hand, digital innovation promises efficiency and transparency; on the other hand, existing regulations are not yet fully capable of guaranteeing fair access, legal security, and public trust. This paper constructs a research roadmap by positioning electronic land certificates as part of Indonesia's digital governance transformation while simultaneously examining emerging societal concerns regarding legal certainty, cybersecurity, and public trust. The study begins with an analysis of regulatory policies, followed by an exploration of socio-legal responses within society. Furthermore, the research evaluates whether electronic certificates function as an innovative digital breakthrough capable of improving

[11] Ikhtiyor Djuraev et al., "The Impact of Digitization on Legal Systems in Developing Countries," *Qubahan Academic Journal* 5, no. 1 (January 2025): 81–117, https://doi.org/10.48161/qaj.v5n1a1246.

[12] Fokky Fuad et al., "Ownership of Land: Legal Philosophy and Culture Analysis of Land Property Rights," *Jurnal Media Hukum* 30, no. 2 (December 2023): 98–116, https://doi.org/10.18196/jmh.v30i2.18264.

[13] Jason Grant Allen, Jane Loo, and Jose Luis Luna Campoverde, "Governing Intelligence: Singapore's Evolving AI Governance Framework," *Cambridge Forum on AI: Law and Governance* 1 (2025): e12, https://doi.org/10.1017/cfl.2024.12.

land administration efficiency or instead generate new challenges related to technological inequality, cultural resistance, and distrust toward digital legal systems. Digital transformation in the land sector cannot be understood merely as an administrative project, but rather as a socio-legal process involving changes in paradigms, values, and power relations between the state and its citizens. This study departs from the assumption that the success of the electronic land certificate policy is not only determined by the government's technical ability to manage digital systems, but also by social legitimacy and legal readiness to adapt to technological dynamics.

# Method

This study uses a digital observation approach to analyze the relationship between digital transformation in the land system and public perception of the electronic land certificates from the relevant website or digital platform with purposive sampling. This approach combines on public perceptions regarding the implementation of the digital land system, using secondary data from previous research. The analysis was conducted using qualitative-descriptive methods, tracing how electronic land certificate implementation impacts social practices and the extent to which the public assesses the legal legitimacy of electronic certificates.[14] Thus, this method not only assesses the effectiveness of regulations in implementation but also tests the social resonance of digital law in the context of justice, certainty, and legal benefits.

# Result & Discussion

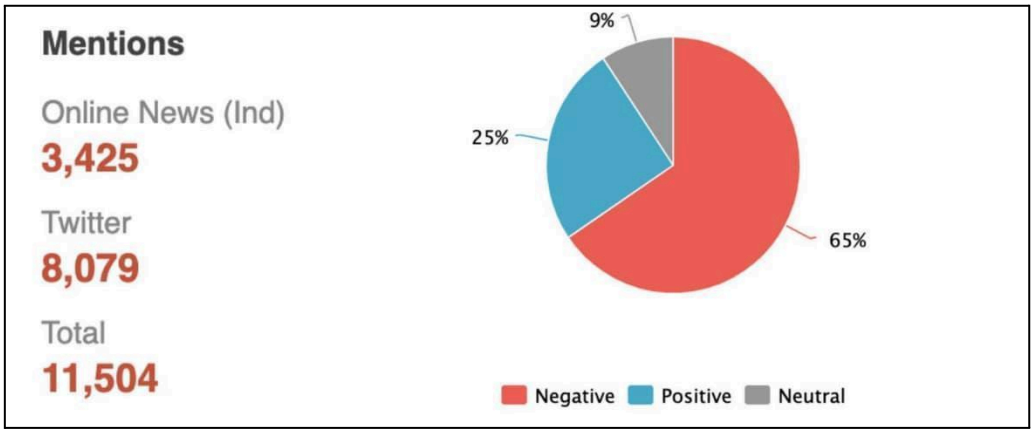
## A. Social and Legal Impact: Trust, Resistance, and Fearfulness

This study stems from the understanding that law is not only an abstract and formally binding normative order but also a living social phenomenon that functions within the context of power relations, trust, and specific social structures. Theoretically, this study is based on the concept of legal

[14] Ardiansyah Fahmi and Anas Luthfi, "Legal Study on the Validity of Electronic Notarial Deeds in Indonesia: Regulatory Analysis and Practical Implications," *Journal of Public Representative and Society Provision* 5, no. 2 (May 2025): 397–406, https://doi.org/10.55885/jprsp.v5i2.544.

legitimacy proposed by Max Weber and further developed by Jürgen Habermas. Weber emphasizes that legal legitimacy stems from formal rationality, which presupposes public compliance with the law due to its legitimate and rational authority. Meanwhile, Habermas proposed a more communicative approach, namely that legal legitimacy should not be based solely on formal compliance but must arise from a rational, participatory, and intersubjective process of public communication. In the context of electronic land certificates, legal legitimacy is determined not only by the power of the state in setting policy but also by the level of social acceptance of a digital land system that is considered secure, transparent, and fair.[15]

This theoretical basis is reinforced by the concept of social trust theory, which highlights the importance of trust as social capital in the successful implementation of digital policies. In modern legal systems, public trust is a prerequisite for the effectiveness of the law because, without it, the law loses its power as a binding norm. Public trust in the digital land system is largely determined by perceptions of data security, process transparency, and legal protection guarantees in the event of disputes or rights violations. Therefore, assessing the success of electronic land certificate policies cannot ignore the empirical dimension of social trust. If we refer to public perception in 2021, it is known that the implementation of electronic land certificates tends to have a negative connotation, and there is a general lack of trust in the implementation of electronic land certificates, as shown below:




[15] Anita Octaria Tambun, Heranisty Nasution, and Ruth Cahyanti Simanjuntak, "Optimization of Government Administration Reform: SWOT Analysis of Electronic Land Certificate Implementation through Keyword Visualization Identification," *Journal La Sociale* 6, no. 1 (January 2025): 199–213, https://doi.org/10.37899/journal-la-sociale.v6i1.1808.

**Figure 1.** Public sentiment regarding the implementation of electronic land certificates (Pers Drone Emprit Publication, 2021).[16]

The sentiment survey results (Figure 1) indicate that the implementation of electronic land certificates has a dominant negative sentiment of 65%, while positive sentiment only reaches 25% and neutral sentiment 9%. The high negative sentiment indicates ongoing public concerns regarding data security, system transparency, and the readiness of digital infrastructure. Additionally, the higher intensity of conversations on Twitter compared to online media indicates that this issue is a dynamic and controversial public concern in the digital space. The results indicate that the level of public trust in the implementation of electronic land certificates is still relatively low. The dominance of negative sentiment at 65% indicates public doubt regarding data security, legal protection, the reliability of digital systems, and the potential risk of information misuse. This condition suggests that the transformation of electronic-based land services has not yet been fully accepted by the public, necessitating increased transparency, digital education, and system security enhancements to build legitimacy and sustained public trust. Therefore, the government must provide extensive socialization and education regarding the benefits and advantages of implementing electronic land certificates. One of the important parts is the government's clarification of the negative sentiments in society.

Clarifications and official explanations from the BPN dominate the topic map of online news coverage regarding electronic land certificates. The majority of news headlines focus on the government's efforts to dispel public concerns, such as the issue of withdrawing physical certificates, data security, and the legality of electronic documents.

[16] Ismail Fahmi, "Sertipikat Tanah Elektronik," Drone Emprit Publications, February 6, 2021, https://pers.droneemprit.id/sertipikat-tanah-elektronik/.


**Figure 2.** The topic map of online news coverage regarding electronic land certificates (Pers Drone Emprit Publication, 2021).[17]

The dominance of this defensive theme indicates that the implementation of electronic certificates still faces public resistance and high levels of misconception in society. In addition, the intensity of institutional communication shows that the government is striving to build legitimacy, enhance digital literacy, and strengthen public trust in the national electronic-based land service transformation.

[17] Ismail Fahmi, "Sertipikat Tanah Elektronik,"

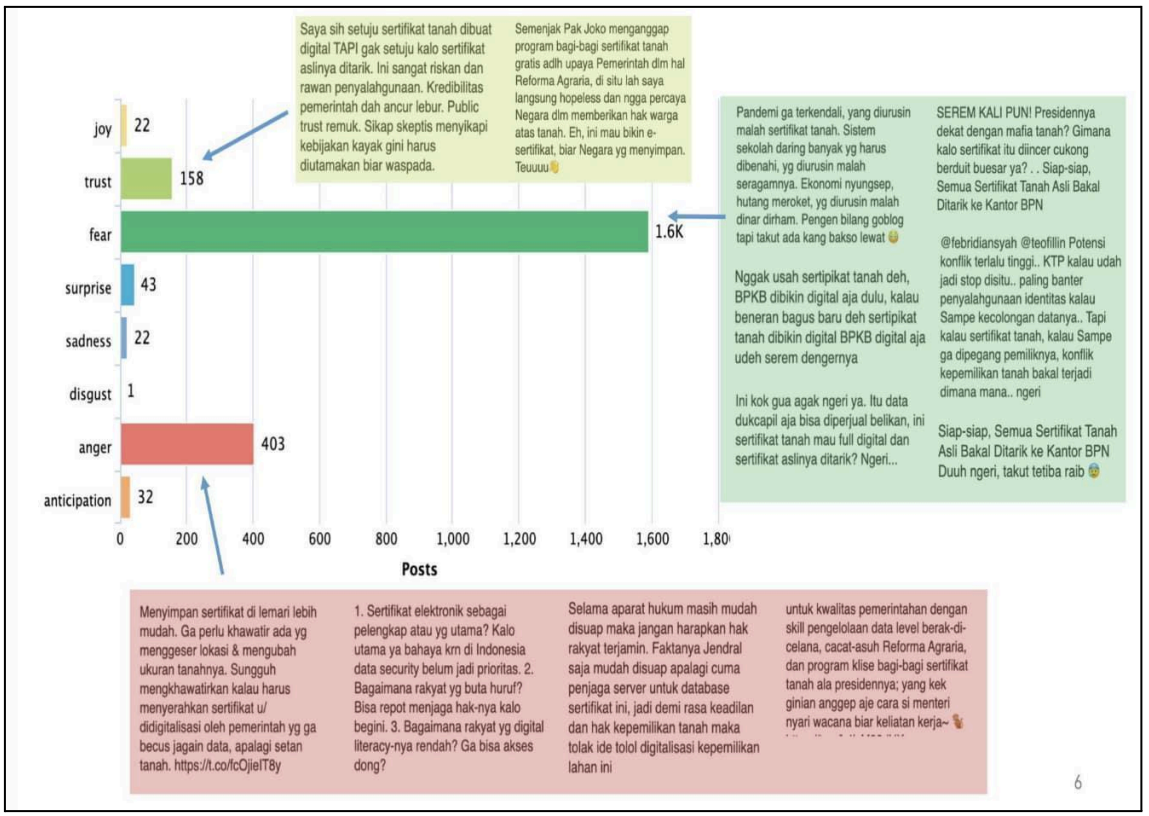



**Figure 3.** The most dominant emotion shown by the public regarding the implementation of electronic land certificates (Pers Drone Emprit Publication, 2021).[18]

Figure 3 shows an analysis of public emotions toward the implementation of electronic land certificates, dominated by the emotion of fear with 1.6 thousand conversations, followed by anger with 403 posts and trust with 158 posts. The dominance of fear reflects the high level of public concern regarding data security, the risk of losing ownership rights, and the potential misuse of the digital system. The comments that emerged reflect a low level of trust in the government's readiness to maintain the security of electronic certificates. Additionally, sentiments of anger and skepticism indicate social resistance to the digitization of land services. These conditions indicate that policy implementation still faces challenges in terms of legitimacy, transparency, and digital literacy in the wider community.

## B. Digital Transformation in Indonesia's Land System: From Analog to Digital Document

[18] Ismail Fahmi.

Digital transformation in Indonesia's land system is part of a major agenda of bureaucratic reform and modernization of national agrarian law. This policy is driven by the country's need to realize more efficient, transparent, and accountable land governance, as mandated in Government Regulation Number 18 of 2021 concerning Management Rights, Land Rights, Apartment Units, and Land Registration. The transformation is further elaborated in Regulation of the Minister of Agrarian Affairs and Spatial Planning/Head of the National Land Agency Noumber 3 of 2023 concerning the Issuance of Electronic Documents in Land Registration Activities, which normatively marks a paradigm shift from a conventional land administration system based on physical documents to a digital system based on electronic data. This shift marks the state's efforts to respond to the challenges of the digital economy era, where speed, efficiency, and data integrity are important elements in the delivery of public services and the enforcement of citizens' civil rights.[19]

The electronic land certificate policy launched by the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) is designed to integrate the entire land registration process, from measurement and mapping to certificate issuance, into a national digital system. Through this system, all land data will be stored in a centralized electronic database connected to a multi-layered security system to ensure the authenticity and validity of documents. The main objectives of this policy are to create bureaucratic efficiency, minimize the potential for document duplication and manipulation, and prevent land mafia practices that have been exploiting the weaknesses of the manual system. Normatively, this transformation is also intended to strengthen the principles of legal certainty and transparency, two fundamental principles in the national land system that have often been eroded by closed and non-standardized administrative practices. Thus, land digitization is not merely a technological policy, but also a legal instrument to renew the legitimacy and credibility of the land system in Indonesia.[20]

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[19] Muhlis Hafel, "Digital Transformation in Politics and Governance in Indonesia: Opportunities and Challenges in the Era of Technological Disruption," *Society* 11, no. 2 (December 2023): 742–57, https://doi.org/10.33019/society.v11i2.577.

[20] Navasha Hadiya Putri and Yulia Hanoselina, "Implementation of the Land Management Application as an Effort to Prevent Land Disputes through Digitalization Services," *Journal of Educational Management Research* 4, no. 6 (October 2025): 2558–71, https://doi.org/10.61987/jemr.v4i6.1412.


**Figure 4.** Transformation of proof of land ownership rights in Indonesia (Kementerian ATR/BPN, 2024).[21]

Figure 4 shows the transformation of land certificates in Indonesia from analog documents in the form of physical books since 1964 to electronic certificates in 2024. This change reflects the modernization of land administration through data digitization, service efficiency, and improved accessibility and system integration. However, the transition to electronic formats has also generated negative perceptions in society. The main concerns are related to data security, hacking risks, potential loss of ownership rights, and low trust in the government's capacity to maintain the digital system. Moreover, the shift from physical to digital evidence creates psychological uncertainty because people are more accustomed to trusting physical documents as tangible and secure proof of ownership.

Nevertheless, the practical implementation of electronic certificates continues to encounter a range of structural and technical challenges. One of the main challenges lies in the imbalance of digital infrastructure between regions, especially in areas with low internet connectivity and minimal technological resources.[22] According to a survey by the Indonesian Internet

[21] Kementerian ATR/BPN, "Selayang Padang Sertipikat Elektronik," 2024, https://www.atrbpn.go.id/infografis/selayang-padang-sertipikat-elektronik.

[22] Chi Yan Hui et al., "Mapping National Information and Communication Technology (ICT) Infrastructure to the Requirements of Potential Digital Health Interventions in Low- and Middle-Income Countries," *Journal of Global Health* 12 (2022): 04094, https://doi.org/https://doi.org/10.7189/jogh.12.04094.

Service Providers Association (APJII), the number of internet users in 2026 is estimated to reach 235,261,078 people out of a total population of 287,886,782 people. This fact indicates a high national internet penetration rate, but it is not evenly distributed across each island. Java remains the region with the largest number of users, while Maluku and Papua are in the lowest positions. Internet penetration in Java reached 85.95%, contributing 58.24% of the total national users. Kalimantan is not far behind with 80.40% penetration and 6.20% contribution. Sumatra recorded 78.24% penetration and 20.74% contribution. Bali and Nusa Tenggara have 78.14% penetration, 5.26% contribution. Sulawesi occupies 72.58% penetration, 6.62% contribution. Meanwhile, Maluku and Papua only have 69.74% penetration and 2.94% contribution.[23]

In addition, land data security systems remain a major concern, given the increasing threat of cyberattacks and the potential for personal data leaks that could threaten the integrity of land ownership evidence.[24] This reality shows that the success of digital reform depends not only on the existence of regulations but also on technical, institutional, and human resource readiness.

**Figure 5.** Verification Security and Display of Electronic Certificates from the Ministry of Agrarian Affairs and Spatial Planning/National Land

[23] Lina F, "Kesenjangan Digital: Maluku dan Papua Hadapi Penetrasi Rendah," Bisik.id, May 22, 2026, https://www.bisik.id/read/kesenjangan-digital-maluku-dan-papua-hadapi-penetrasi-rendah-1779438042293.

[24] Vinden Wylde et al., "Cybersecurity, Data Privacy and Blockchain: A Review," *SN Computer Science* 3, no. 2 (January 2022): 127, https://doi.org/10.1007/s42979-022-01020-4.

Agency through the Sentuh Tanahku application (Kementerian ATR/BPN, 2024).[25]

Figure 5 shows various security indicators on the electronic land certificate designed to enhance the validity and security of digital documents. These indicators include certified electronic signatures, QR codes for document authenticity verification, integration of digital-based land field maps, and a validation system through an official application. In addition, the presence of watermarks, owner identification, and spatial coordinates strengthens the authentication of land data. The use of electronic systems also allows for real-time tracking of data changes, thereby reducing the risk of document forgery. Thus, the government is striving to build a land system that is more transparent, integrated, efficient, and has a higher level of administrative security compared to conventional physical certificates.

This further emphasizes that the government is striving to strengthen the security and legitimacy of land ownership evidence through the transformation of electronic certificates. Various security features indicate a more modern administrative and technological approach. These efforts aim to minimize document forgery, enhance land data transparency, and expedite the ownership validation process. Thus, the digitization of land certificates is not only oriented toward service efficiency but also toward strengthening legal protection and the sustainable security of community ownership data.[26]

[25] Kementerian ATR/BPN, "Selayang Padang Sertipikat Elektronik."

[26] Liliana Tediosaputro and Retno Mawarini Sukarningsih, "Electronic Land Certificate Versus Analog Land Certificate in Proof of Ownership Certainty," *Proceedings of the International Conference On Law, Economics, and Health (ICLEH 2022)* (Paris), Advances in Social Science, Education and Humanities Research, vol. 723 (2023): 150–57, https://doi.org/10.2991/978-2-38476-024-4_18.

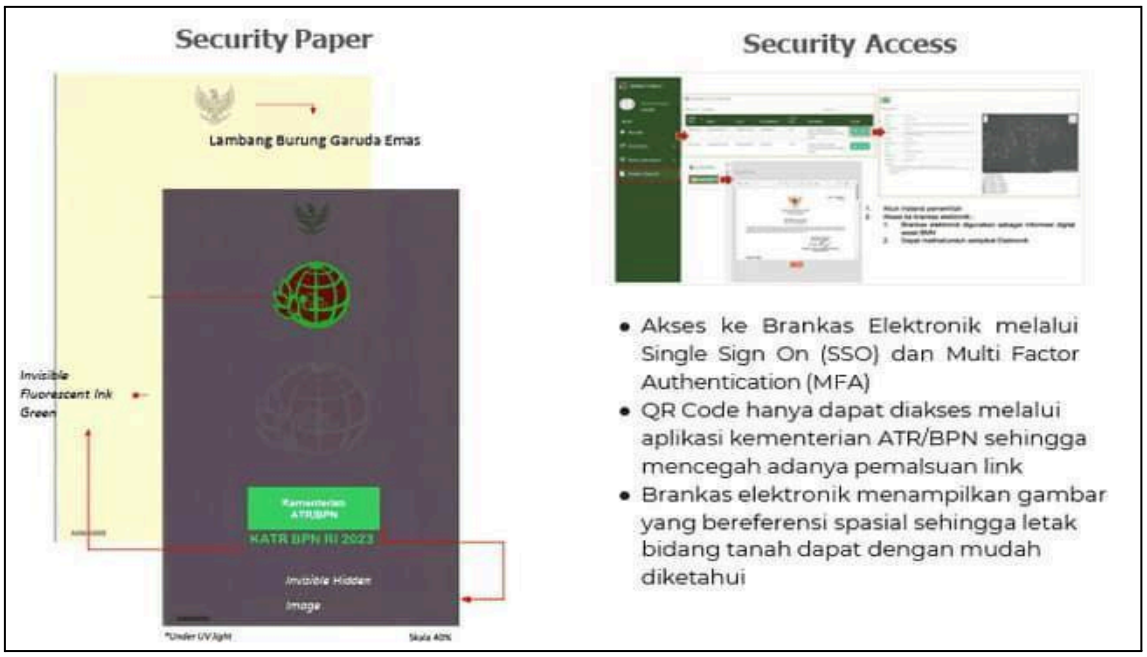


**Figure 6.** Electronic Certificate Security Features (Kementerian ATR/BPN, 2024).[27]

Figure 6 illustrates the security architecture of Indonesia's electronic land certificate system implemented by the Ministry of ATR/BPN. On the left side, the "Security Paper" section demonstrates multiple physical security features, including the Garuda emblem, invisible fluorescent ink, and hidden images visible under ultraviolet light, indicating efforts to prevent document forgery. Meanwhile, the "Security Access" section highlights digital protection mechanisms through Single Sign-On (SSO), Multi-Factor Authentication (MFA), and QR code verification accessible only via the official ATR/BPN application. Furthermore, the electronic vault integrates spatially referenced land data, reflecting the government's attempt to combine physical security, cybersecurity, and administrative transparency within the digital land governance framework.

## C. Challenging Innovation and Regulation Efforts on Implementation of Land Certificate Electronic

[27] Kementerian ATR/BPN, "Selayang Padang Sertipikat Elektronik."

The digital transformation of Indonesia's land system through the implementation of electronic certificates is a progressive step that marks the country's commitment to efficiency, security, and transparency in agrarian governance. However, behind this technological advancement lie serious challenges in terms of ethics and legal policy, particularly with regard to personal data protection and the potential for digital manipulation. Electronic land certificates store sensitive information, including ownership data, boundaries, and the economic value of the land. Uploading and storing this data in a digital system poses a real threat of leaks, misuse, and cyberattacks.[28] Cases of hacking of government agency data that have occurred in Indonesia show that cybersecurity infrastructure is not yet fully mature to secure high-stake systems such as land administration. Therefore, the urgency of establishing a legal framework that balances innovation with data protection is inevitable.

In facing these challenges, it is important to develop an ethical framework that places digital ethics as a key pillar in e-governance policies in the land sector. Digital ethics here does not only mean responsible technology governance, but also includes the institutional responsibility of the state in ensuring that every innovation is carried out within the corridor of legal morality. This is in line with Jürgen Habermas' view of communicative legitimacy, where public policy only gains legitimacy if it is formulated and implemented through a process that is transparent, rational, and accountable to the public.[29] Thus, every step of digitization must be accompanied by clear accountability mechanisms, whether in the form of data security audits, public involvement in policy formulation, or mechanisms for reporting potential violations of citizens' digital rights.

From a regulatory perspective, a trust-based regulation approach is a relevant strategy for balancing innovation with legal certainty. This approach emphasizes the importance of building trust between the government, society, and the private sector through transparency, digital

[28] Mohd Aamir Adeeb Abdul Rahim et al., "Data Leaks Through Public Digital Document Libraries: A Growing Concern in Relation to Personal Data Protection and Cyber Security Regulations," *2024 7th International Conference on Internet Applications, Protocols, and Services (NETAPPS)*, November 2024, 1–6, https://doi.org/10.1109/NETAPPS63333.2024.10823567.

[29] Fanny Graciela Egas Moreno et al., "Considerations on Citizen Participation in the Development of Public Policies: Insights from a Habermasian Perspective," *Sapienza: International Journal of Interdisciplinary Studies* 5, no. 3 (September 2024): e24057, https://doi.org/10.51798/sijis.v5i3.636.

literacy, and multi-stakeholder collaboration. Overly rigid regulations can hinder innovation, while excessively lax regulations risk abuse. Therefore, countries need to develop adaptive frameworks that are responsive to technological changes, such as the establishment of regulatory sandboxes in the land sector to test electronic certificate systems before they are widely implemented. This trust-based approach is not only about regulation, but also about creating a digital environment that is safe, inclusive, and equitable.[30]

Finally, the digitization of the land system must be understood not merely as a technological project, but as a social and moral project that aims to strengthen legal legitimacy and public trust in the state. Efforts to balance innovation and regulation require meaningful public engagement, so that digital transformation does not become an elitist agenda that alienates the public from the legal system they are supposed to trust. Legal and digital literacy are key to avoiding social exclusion due to knowledge and access gaps. Thus, electronic certificates will only be truly effective if they can guarantee not only legal certainty, but also social justice and the sustainability of public trust in the national land system.[31]

The implementation of electronic certificates in Indonesia's land system is a concrete manifestation of digital transformation efforts in the field of state administrative law that are oriented towards efficiency, transparency, and legal certainty. The main advantage of this innovation lies in its ability to strengthen the integrity of land data and minimize manipulative practices that have often occurred in the conventional certification process. Through digitization, all land ownership data is systematically recorded in a centralized database managed by the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN), enabling faster, more accurate, and more easily traceable verification processes.

This is in line with the spirit of Articles 5 and 6 of Government Regulation Number 18 of 2021 concerning Management Rights, Land Rights, Apartment Units, and Land Registration, which emphasizes the digitization of land registration as part of the modernization of the national

[30] Miftachul Huda, "Empowering Communication Strategy for Safe Cyberspace: Insights from Trust-Based Quality Information," *Global Knowledge, Memory and Communication*, ahead of print, July 16, 2024, https://doi.org/10.1108/GKMC-09-2023-0345.

[31] Mohammed Shuaib et al., "Land Registry Framework Based on Self-Sovereign Identity (SSI) for Environmental Sustainability," *Sustainability* 14, no. 9 (January 2022): 5400, https://doi.org/10.3390/su14095400.

land system. From an administrative efficiency perspective, this system cuts through long bureaucratic chains and opens up more inclusive access to public services, in line with the principles of effective governance. In addition, electronic certificates support the creation of traceability and accountability in every legal land transaction, thereby strengthening the function of law as a means of social control and a guarantee of the certainty of rights.[32] The implementation of a certified digital signature-based system also increases the legal validity of electronic documents as stipulated in Law Number 11 of 2008 concerning Electronic Information and Transactions (ITE) and its implementing regulations. Thus, electronic certificates can be considered a progressive step in building an agrarian legal ecosystem that is efficient, modern, and responsive to developments in information technology.

However, these advantages are not without a number of limitations and challenges that raise legal and social issues. From a legal perspective, the use of electronic certificates faces problems of legal certainty and legal validity, particularly in the context of evidence in court. Although electronic documents are legally recognized, in the practice of agrarian litigation there are still doubts among judges and the public regarding the authenticity and evidentiary value of certificates that do not have a physical form. This situation creates a dilemma between the principle of digital efficiency and the principle of prudence in land administration. In addition, there are serious challenges in terms of cybersecurity and the protection of landowners' personal data. Digital systems that manage data on high-value economic assets such as land are highly vulnerable to cyber attacks, hacking (data breaches), and digital identity fraud. This shows that digital security infrastructure and human resource readiness within the ATR/BPN environment remain weak points in policy implementation.[33]

From a social perspective, the digital divide between urban and rural areas exacerbates inequality in access to electronic land services. Communities in areas with limited technological infrastructure or low digital literacy are potentially marginalized from online service systems,

[32] Deny Haspada, "The Legal Validity of Electronic Certificates as Evidence of Legitimate Land Ownership," *European Journal of Law and Political Science* 4, no. 2 (April 2025): 22–27, https://doi.org/10.24018/ejpolitics.2025.4.2.169.

[33] Lingling Li et al., "How to Use Evidence Rules Reasonably to Resolve Land Disputes: Analysis of Typical Land Dispute Cases from China," *Land* 13, no. 8 (August 2024): 1187, https://doi.org/10.3390/land13081187.

giving rise to a new form of structural injustice in access to land rights.[34] This situation has the potential to erode public trust in the legitimacy of the digital land system and cause social resistance to government policies. Therefore, the success of digital legal transformation through electronic certificates depends not only on technological readiness and regulations, but also on the state's commitment to ensuring equitable access, protecting landowners' rights, and enforcing the principle of trust-based governance that places public trust as the foundation of legal legitimacy in the digital era.

In the context of electronic certificate regulation, the provisions that should provide legal certainty regarding the security of systems and electronic data can actually be found in Article 84 of Government Regulation Number 18 of 2021 concerning Management Rights, Land Rights, Apartment Units, and Land Registration. The article emphasizes that land registration can be conducted electronically thru an electronic system organized by the ministry. However, the norm is still general and does not explicitly regulate cybersecurity standards, personal data protection, cyber attack mitigation mechanisms, or state responsibility in the event of electronic data breaches or manipulation. Furthermore, in the Regulation of the Minister of Agrarian Affairs and Spatial Planning/Head of the National Land Agency Number 1 of 2021 concerning Electronic Certificates, which was later revoked and replaced by Regulation Number 3 of 2023 concerning the Issuance of Electronic Documents in Land Registration Activities, the regulation on electronic documents has actually emphasized the use of electronic systems and the validation of digital documents. However, the regulation has not yet detailed aspects of data security, system security audits, encryption standards, data recovery (disaster recovery), and legal protection for the public in the event of an electronic system failure. As a result, although Article 84 of Government Regulation Number 18 of 2021 serves as the legal basis for land digitization, the substance of protection for the security of electronic certificates still does not provide adequate legal certainty for the public. This is the main challenge for achieving legal certainty in the implementation of electronic certificates from a legal perspective.

[34] Cynthia K. Sanders and Edward Scanlon, "The Digital Divide Is a Human Rights Issue: Advancing Social Inclusion Through Social Work Advocacy," *Journal of Human Rights and Social Work* 6, no. 2 (June 2021): 130–43, https://doi.org/10.1007/s41134-020-00147-9.

# Conclusion

The digital transformation of Indonesia's land administration through electronic land certificates can become a successful legal and technological innovation if it is supported by adaptive regulations, strong cybersecurity systems, transparent data governance, and broad public participation. The policy will also succeed when the government is capable of increasing digital and legal literacy, strengthening institutional accountability, and ensuring equal technological infrastructure across regions, particularly in rural areas. In this condition, electronic certificates may function as instruments of administrative efficiency, legal certainty, and sustainable digital justice within Indonesia's agrarian governance system. However, the implementation of electronic land certificates risks failure if digitalization is carried out solely as a bureaucratic modernization project without considering socio-cultural readiness and public trust. The policy may generate new forms of resistance and fearfulness when cybersecurity vulnerabilities, data manipulation risks, weak privacy protection, limited infrastructure, and lack of public understanding remain unresolved. Likewise, the absence of clear regulations regarding digital evidence, accountability mechanisms, and legal protection for affected citizens may deepen distrust toward the electronic land system.

Therefore, this study recommends that the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) strengthen institutional transparency, improve public outreach programs, develop integrated cybersecurity protection systems, and establish responsive complaint and dispute resolution mechanisms related to electronic certificates. ATR/BPN also needs to ensure that digital land services remain accessible and understandable for communities with limited technological literacy. In addition, the Ministry of Communication and Digital Affairs (Komdigi) is expected to reinforce national digital infrastructure, strengthen cybersecurity governance, expand internet accessibility in rural areas, and formulate stricter data protection standards to support the reliability and legitimacy of Indonesia's electronic land administration system. Accordingly, the future of electronic land certificates depends not only on technological advancement, but also on the state's ability to balance innovation, legal legitimacy, cybersecurity, and social trust within the digital transformation process.

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