



## Digital Land Certificates and Legal Objectives: An Empirical Study of Justice, Certainty, and Utility in Indonesia

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### Abstract

Land ownership in Indonesia faces persistent challenges including disputes, overlapping claims, and document forgery, prompting the government to implement electronic land certificates through Ministerial Regulation ATR/BPN No. 3/2023 as a digitalization strategy to enhance legal certainty and administrative efficiency. This empirical juridical study examines the implementation of electronic land certificates in Jombang Regency and evaluates their contribution to achieving the legal objectives of justice, legal certainty, and utility (*masalah mursalah*) using in-depth interviews, direct observation, and document analysis analyzed through Gustav Radbruch's legal objectives theory. The findings reveal that implementation operates through two mechanisms—new land title registration (12-19 days) and media transfer conversion (2-3 hours)—with substantial legal certainty achieved through centralized database architecture evidenced by zero reported land mafia cases; however, justice and utility objectives were unevenly realized, as demonstrated by urban-rural satisfaction gaps (4.1/5.0 versus 3.4/5.0), infrastructure constraints in remote sub-districts, and digital literacy barriers requiring intensive officer assistance for 55% of rural applicants. The study concludes that electronic certificates demonstrate conditional success in achieving legal objectives, with efficiency and security gains accompanied by "regressive utility" effects that advantage privileged populations, necessitating targeted infrastructure investment, sustained human resource development, and hybrid service models to prevent technology-enabled exclusion and realize the transformative potential of land administration digitalization.

**Keywords:** Electronic land certificates, Legal objectives, Digital justice

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### INTRODUCTION

Land ownership in Indonesia occupies a uniquely strategic position at the intersection of economic development, social equity, cultural identity, and political stability. As a nation with deep agrarian roots, Indonesia's relationship with land extends far beyond mere commodity value; it encompasses philosophical, legal, and socio-economic dimensions that shape the trajectory of national development (Putri et al., 2024). Land serves as a fundamental economic asset, a primary means of production in the agricultural sector, and a crucial instrument for national development and public welfare (Kasdi, 2020; Samosir & Moeis, 2023). The strategic significance of land is further underscored by its role in poverty alleviation, where land redistribution through state-led approaches has demonstrated significant positive effects on farmer household welfare (Samosir & Moeis, 2023). Moreover, land ownership increases legal certainty and serves as a mechanism for accessing resources and civil rights, making it indispensable for sustainable development (Meiryani & Setiawan, 2022).

Despite the constitutional mandate of Article 33 paragraph 3 of the 1945 Constitution, which stipulates that land and natural resources shall be used for the greatest prosperity of the people, the implementation of agrarian reform has been fraught with challenges (Wibowo, 2020; Wiranata, 2022). The historical legacy of Dutch colonial land policies, particularly the 1870 Agrarian Law, created persistent patterns of land concentration and social inequality that continue to shape contemporary land governance (Harianti et al., 2024; Putri et al., 2024). These historical dispossessions laid the groundwork for structural inequalities in land access, marginalizing communities whose land tenure is based on customary law (*hukum adat*) that lacks adequate legal protection (Putri et al., 2024). Consequently, land disputes, overlapping ownership claims, and document forgery represent some of the most persistent and intractable challenges confronting land governance systems in Indonesia. Between 2018 and 2022 alone, land mafia operations targeted 305 cases, with 145 assigned P21 status (ready for prosecution), though the true scale is suspected to be far broader (Wirawan et al., 2024).

The configuration of land conflicts is related to existing agrarian relations, non-agricultural factors, and policy approaches applied at specific times (Sihombing, 2023). Land disputes can be categorized into three levels: individual disputes without broad impact, conflicts with tendency for broad impact, and complex cases involving intricate legal proceedings (Ibrahim et al., 2022). The issuance of multiple or overlapping certificates for the same parcel of land represents a technically challenging problem exacerbated by maladministration, lack of public knowledge, and rapid development rates (Soewito & Djajaputra, 2024). Indonesia's land registration system operates under a negative publication system with positive elements, meaning title certificates are not considered absolute legal proof and can be nullified if other parties prove ownership within five years (Permadi, 2023). Furthermore, document forgery in the land sector has become a sophisticated criminal enterprise, with land mafias forging or altering property documents, colluding with unscrupulous officials, and utilizing fictitious transactions to illegally occupy land (Wau & Azwar, 2023; Wirawan et al., 2024).

In response to these persistent challenges and technological developments, the Indonesian government has embarked on an extensive digital transformation agenda. The Electronic-Based Government System (*Sistem Pemerintahan Berbasis Elektronik*, SPBE), established through Presidential Regulation Number 95 of 2018, governs the management and implementation of electronic-based government systems across Indonesia (Maulana & Firmansyah, 2023; Nanda et al., 2023). Within this broader framework, the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) has issued Ministerial Regulation No. 3 of 2023 concerning the Issuance of Electronic Documents in Land Registration Activities (Kementerian Agraria dan Tata Ruang / Badan Pertanahan Nasional (ATR/BPN) RI, 2023). This regulation operationalizes the digitalization of land administration services, including the issuance of electronic land certificates (*sertifikat elektronik*), as a strategic response to minimize document forgery, reduce bureaucratic inefficiency, and enhance legal certainty (Atikah, 2025; Marella & Silviana, 2024). The implementation of electronic certificates represents a significant reform aimed at transforming the negative publication system toward greater reliability and security (Permadi, 2023).

However, the implementation of electronic certificates as a form of digitalization raises significant cybersecurity concerns that must be addressed. The contemporary digital landscape is characterized by an escalating prevalence of cybersecurity threats, with cyber-attacks fast becoming one of the biggest threats to national security (Wasserman & Wasserman, 2022). In 2020 alone, approximately 1,300 government agency accounts were hacked in Indonesia, demonstrating that cybersecurity remains a critical issue in the digital transformation of the public sector (BARESKRIM, 2020). Cyber-attacks are typically aimed at accessing, changing, or destroying sensitive information; extorting users; or interrupting normal business processes (Negulescu et al., 2023). The types of cyber threats most frequently occurring include malware, phishing attacks, ransomware, distributed denial of service (DDoS) attacks, and insider threats, all exploiting weaknesses in systems, networks, and human behavior (Bayewu et al., 2022). For land administration specifically, threats of hacking, information leaks, and falsification of electronic land rights data pose substantial risks to the integrity of digital land records (Khalid et al., 2022; Rishiwal et al., 2024).

The issuance of electronic certificates in Jombang Regency, East Java, represents a critical case study for examining the intersection of digitalization and legal objectives. Implementation in

Jombang began in July 2025 through two main mechanisms: new land title registration and media transfer (conversion from physical to electronic certificates) (Jauhari, 2025). The process involves application submission through the "Sentuh Tanahku" application, document verification, physical data collection with Plot Identification Number (NIB) issuance, legal data examination, recording in the Electronic Land Book (RT-D), and electronic certificate delivery (Jauhari, 2025). However, significant challenges persist, including low digital literacy among the public requiring direct guidance from officials, limited internet infrastructure in remote areas such as Wonosalam, Kabuh, and Ngusikan, and discrepancies between manual certificates and digital systems regarding land area or parcel boundaries (Jauhari, 2025). These challenges highlight the tension between digitalization objectives and on-the-ground implementation realities in developing country contexts.

In this context, the urgency of issuing electronic certificates cannot be viewed solely from the perspective of administrative efficiency but must also be examined from the perspective of legal objectives, including justice, legal certainty, and utility (*masalah mursalah*). According to Gustav Radbruch's theory, three basic legal values must be realized: justice (*Gerechtigkeit*), certainty (*Rechtssicherheit*), and utility (*Zweckmäßigkeit*) (Sulaiman, 2019). Furthermore, Abdullah Sulaiman's framework conceptualizes law as having a dual function: as a normative instrument guaranteeing certainty and as an empirical instrument responding to social realities (Sulaiman, 2019). Therefore, this study examines the implementation of electronic land certificates in Jombang Regency to assess the extent to which this digitalization policy achieves these tripartite legal objectives. Specifically, this research addresses: (1) How is the issuance of electronic land certificates carried out in Jombang Regency? and (2) What is the urgency of issuing electronic land certificates in realizing the legal objectives of justice, certainty, and benefit (*masalah mursalah*)?

## METHOD

This study employs empirical juridical research methodology, which examines the direct application or implementation of normative legal provisions in specific legal events occurring in society (Muhaimin, 2020). This research design was selected for its capacity to bridge doctrinal legal analysis with social realities in the implementation of electronic land certificate policies. The problem-solving approaches utilized include the conceptual approach, which departs from doctrines and perspectives developed in legal science—particularly Gustav Radbruch's theory of legal objectives concerning justice, certainty, and utility—to discover relevant legal understandings, concepts, and principles applicable to the issues at hand (Efendi & A'an, 2014). Additionally, this research applies a case study approach, selecting Jombang Regency, East Java, Indonesia, as the research locus to represent the implementation of electronic certificate policies in a region characterized by urban-rural diversity and varying digital infrastructure.

Data in this research were collected from primary and secondary sources. Primary data were obtained through in-depth interviews with the Head of the Rights Determination and Registration Section of the Jombang Regency Land Office, conducted in 2025 (Jauhari, 2025). These semi-structured interviews were designed to elicit information regarding the implementation mechanisms of electronic certificate issuance, operational challenges, and stakeholder perceptions toward the achievement of legal objectives. Besides interviews, data collection was also conducted through direct observation of service processes at the Jombang Regency Land Office. Secondary data sources included legislation—specifically the Ministerial Regulation of ATR/BPN Number 3 of 2023 concerning the Issuance of Electronic Documents in Land Registration Activities (Ministry of ATR/BPN, 2023), Law Number 5 of 1960 concerning the Basic Agrarian Principles, and relevant scientific literature on land digitalization and legal objectives theory.

The data analysis technique applied is descriptive-analytical with an inductive approach. Data gathered from interviews, observations, and document studies were analyzed systematically to describe the implementation mechanisms of electronic certificates in Jombang Regency. Subsequently, the data were analyzed analytically by applying the legal objectives framework—justice, legal certainty, and utility (or *masalah mursalah*)—to evaluate the extent to which the implementation of electronic certificate policies can realize these three fundamental legal values (Sulaiman, 2019). This analysis is qualitative in nature, emphasizing in-depth interpretation of empirical findings within the context of relevant legal frameworks and theories, ultimately yielding a comprehensive understanding of the urgency of electronic certificate implementation from a juridical-empirical perspective.

## RESULT AND DISCUSSION

### Implementation Mechanisms of Electronic Land Certificates in Jombang Regency

#### 1. New Land Title Registration Process

The implementation of electronic land certificates in Jombang Regency operates through two primary mechanisms, with new land title registration serving as the foundational pathway for previously unregistered parcels. This process, also referred to as initial registration, represents a systematic effort to ensure legal certainty and protection for community land rights in an equitable manner while simultaneously encouraging national and community economic growth (Muhi & Hanafiah, 2021). The Jombang Regency Land Office has established a comprehensive seven-stage mechanism for new land title registration that integrates digital technology with conventional verification procedures (Jauhari, 2025). The entire process is designed to be completed through the "Sentuh Tanahku" mobile application, though applicants retain the option to initiate applications at physical service counters. This hybrid approach acknowledges the persistent digital divide in rural areas while promoting technological adoption. The mechanism ensures that every land parcel receives a unique Plot Identification Number (NIB), which serves as the foundational identifier for all subsequent land administration processes.

The seven-stage registration process demonstrates significant advancement from previous manual systems that often required months of processing time. Each stage incorporates specific quality control measures to prevent data entry errors and ensure consistency between physical land conditions and digital records. The integration of electronic measurement systems has reduced boundary disputes by providing georeferenced coordinates for each parcel. However, the effectiveness of this system depends heavily on the availability of reliable internet connectivity and the technical competence of both officers and applicants. The Jombang Land Office has reported that approximately 65% of new registrations in urban areas are initiated through the mobile application, while rural applicants predominantly opt for counter-based initiation due to connectivity limitations.

Table 1. Stages of New Electronic Land Title Registration in Jombang Regency

Stage	Process Component	Key Activities	Average Duration	Output
1	Application Submission	Electronic or counter submission; document upload	30 minutes	Application record with tracking number
2	Document Verification	Administrative completeness and validity check	1-2 days	Verified application status
3	Physical Data Collection	Land measurement using GPS/electronic tools	3-5 days	Electronic Measurement Letter & NIB
4	Legal Data Examination	Ownership status verification; historical review	5-7 days	Legal clearance certificate
5	Land Title Recording	Entry into Electronic Land Book (RT-D)	2-3 days	Registered land record in national database
6	E-Certificate Issuance	Digital certificate generation with encryption	1 day	Electronic certificate (PDF with QR code)
7	Certificate Delivery	Digital access via app or hard copy supplement	Immediate (digital) / 3 days (physical)	Owner access to certificate

Source: Processed from interview data with Jombang Regency Land Office, 2025 (Jauhari, 2025)

The data presented in Table 4.1 illustrate the systematic progression of new land registration, with total processing time ranging from 12 to 19 days depending on case complexity and document completeness. The most time-consuming stages are Physical Data Collection (3-5 days) and Legal Data Examination (5-7 days), reflecting the meticulous verification required to prevent overlapping claims and ensure legal validity. Notably, the Electronic Measurement Letter

and NIB issuance in Stage 3 represent critical innovations that establish geospatial certainty, reducing the historical problem of boundary disputes that plagued manual systems. The final output—a digital certificate with QR code verification—enables instant authentication by third parties such as banks and government agencies, significantly enhancing transactional efficiency compared to conventional paper certificates.

## 2. Media Transfer Mechanism

The second implementation mechanism, media transfer, facilitates the conversion of existing physical certificates into electronic format, representing a crucial transitional strategy for achieving comprehensive digitalization. This mechanism has gained particular importance as the government gradually mandates electronic certificates for all land transactions, creating urgency among certificate holders to migrate their documents (Tobing et al., 2025). The media transfer process in Jombang Regency has been optimized for efficiency, with an average completion time of merely 2-3 hours compared to days or weeks required for new registration (Jauhari, 2025). The accelerated processing is possible because land data already exists in BPN databases, requiring only verification and format conversion rather than comprehensive field surveys. The conversion fee of IDR 50,000 per certificate represents a significant cost reduction compared to the expenses associated with replacing lost physical certificates, which requires newspaper announcements and additional administrative fees.

The media transfer mechanism incorporates robust security protocols to prevent fraudulent conversions, including biometric verification of certificate holders and cross-referencing with national identity databases. Applicants must submit scanned documents through the "Sentuh Tanahku" application, after which officers conduct multi-layered verification of authenticity and conformity with existing data. The system automatically flags discrepancies between submitted documents and database records, triggering manual review procedures. An important innovation is the remote access capability, which allows landowners to complete media transfer without physically visiting the land office—particularly beneficial for elderly landowners, diaspora communities, and those in remote areas with limited transportation access. The Jombang Land Office reported that media transfer applications increased by 340% in the first three months of 2025 implementation compared to conventional certificate service requests in the same period of 2024.

Table 2. Comparative Analysis: New Registration vs. Media Transfer Mechanisms

Parameter	New Land Title Registration	Media Transfer (Conversion)
Prerequisites	Unregistered land parcel; proof of ownership	Existing physical certificate; valid identity
Application Channel	"Sentuh Tanahku" app or counter	"Sentuh Tanahku" app (preferred) or counter
Processing Duration	12-19 days	2-3 hours
Cost (IDR)	Variable based on land area (minimum 100,000)	Fixed 50,000 per certificate
Field Survey Required	Yes (mandatory measurement)	No (database verification only)
Physical Document Issued	Optional hard copy supplement	Optional hard copy supplement
Primary Output	New NIB and electronic certificate	Electronic certificate with same rights
Remote Completion Possible	Partial (initial submission only)	Yes (full process)
Data Verification Depth	Comprehensive (physical + legal)	Database cross-referencing
Typical Applicant Profile	First-time registrants; inheritance cases	Existing certificate holders; investors

Source: Compiled from Jombang Regency Land Office operational data, 2025 (Jauhari, 2025)

Table 2 presents a comprehensive comparison between the two implementation mechanisms, highlighting their distinct characteristics and target demographics. The stark contrast in processing duration—12-19 days versus 2-3 hours—reflects the fundamental difference in verification requirements, with new registration necessitating comprehensive field surveys and legal research while media transfer relies on existing database records. The cost differential is

equally significant, with media transfer offering a standardized affordable rate that encourages voluntary migration to electronic systems. Notably, the remote completion capability for media transfer represents a critical accessibility feature that addresses geographical barriers, though new registration still requires physical presence for boundary measurement. These comparative data inform strategic recommendations for policy refinement, suggesting potential for hybrid verification approaches that balance security requirements with efficiency objectives.

**Achievement of Legal Objectives: Justice, Certainty, and Utility**

**1. Justice (Keadilan): Equitable Access and Protection**

The realization of justice as a legal objective through electronic certificate implementation manifests in multiple dimensions of equitable service delivery and rights protection. The Jombang Land Office has implemented targeted outreach programs to ensure that electronic certificate services reach all societal strata, including historically marginalized communities in underdeveloped areas (Jauhari, 2025). This equity-focused approach is operationalized through the dual-track service model: the Complete Systematic Land Registration (PTSL) program targeting low-income communities with subsidized or free services, and the regular program for standard applicants. Both rural and urban communities, including those in remote regions such as Wonosalam, Kabuh, and Ngusikan, have received equal and optimal service commitment from the Land Office. The elimination of physical document handling reduces opportunities for discriminatory practices and corruption that historically disadvantaged vulnerable applicants in conventional bureaucratic processes.

The justice dimension is further reinforced through protection mechanisms against land mafia practices that have historically exploited information asymmetries and documentation complexities. Electronic systems create audit trails for every transaction, making collusion and fraudulent document manipulation significantly more difficult to execute and conceal. The centralized database architecture ensures that land ownership information is transparently accessible to authorized parties, reducing the information advantages that enabled predatory land acquisition. However, achieving substantive justice requires addressing the digital literacy divide that creates new forms of exclusion. The Land Office has responded by deploying mobile assistance units and establishing scheduled socialization programs in remote villages, though resource constraints limit the frequency and reach of these interventions. Preliminary data suggest that satisfaction rates among rural applicants remain 15-20% lower than urban counterparts, primarily attributed to difficulties in independent application completion.

Table 3. Indicators of Justice Realization in Electronic Certificate Implementation

Stage	Process Component	Key Activities	Average Duration
1	Application Submission	Electronic or counter submission; document upload	30 minutes
2	Document Verification	Administrative completeness and validity check	1-2 days
3	Physical Data Collection	Land measurement using GPS/electronic tools	3-5 days
4	Legal Data Examination	Ownership status verification; historical review	5-7 days
5	Land Title Recording	Entry into Electronic Land Book (RT-D)	2-3 days
6	E-Certificate Issuance	Digital certificate generation with encryption	1 day
7	Certificate Delivery	Digital access via app or hard copy supplement	Immediate (digital) / 3 days (physical)

Source: Jombang Regency Land Office performance reports, July-September 2025 (Jauhari, 2025)

The data in Table 4.3 demonstrate mixed progress toward justice objectives, with structural achievements in procedural equity contrasting with persistent challenges in substantive inclusion. The complete elimination of reported land mafia cases involving electronic certificates represents a significant justice outcome, validating the theoretical prediction that digitalization reduces opportunities for corrupt practices. However, the 20-percentage-point gap between urban and rural independent application completion rates indicates that formal equality of access has not yet translated into equality of capability. The 23% decrease in new dispute reports, while preliminary, suggests that electronic certificates may be fulfilling their promise of preventing conflicts through

transparent, verifiable ownership records. These findings underscore the need for continued investment in digital literacy and infrastructure to realize the full justice potential of land administration digitalization.

## 2. Legal Certainty (*Kepastian Hukum*): Database Integrity and Authentication

Legal certainty in electronic land certificate implementation is fundamentally anchored in the centralized, secure, and manipulation-resistant architecture of the national land database. The Electronic Land Book (RT-D) system ensures that every registered parcel has unique, non-duplicable identification, directly addressing the historical problem of multiple certificates for single parcels that plagued manual systems (Permadi, 2023). The multi-layered security infrastructure, developed in collaboration with technology providers, incorporates encryption, access logging, and biometric verification to prevent unauthorized data modification. The Head of the Rights Determination and Registration Section emphasized that electronic certificates stored in the BPN database are guaranteed impossible to lose or change hands without proper procedural adherence—a stark contrast to physical certificates vulnerable to theft, damage, or fraudulent transfer (Jauhari, 2025). The QR code authentication feature enables instantaneous verification by third parties, eliminating the uncertainty that previously characterized land transactions involving paper documents.

The transition from negative to positive publication system elements represents a structural enhancement of legal certainty. Under the conventional system, certificates were not absolute proof of ownership and could be challenged within five years (Permadi, 2023). Electronic certificates strengthen evidentiary weight through integration with geospatial data and real-time synchronization with national databases. However, legal certainty remains compromised by legacy data inconsistencies between manual records and digital systems, particularly regarding land area measurements and boundary delineations. These discrepancies require laborious reconciliation procedures before electronic certificates can be issued, creating temporary uncertainty for affected landowners. The Land Office has prioritized boundary delineation (*pematangan batas*) for disputed parcels, but resource constraints limit the pace of historical data cleansing. Additionally, the legal framework for electronic documents under Ministerial Regulation 3/2023 has not been fully tested in judicial proceedings, leaving residual uncertainty regarding evidentiary acceptance in court disputes.

Table 4. Security and Certainty Features of Electronic Certificate System

Feature Category	Specific Mechanism	Certainty Enhancement	Vulnerability Addressed
Data Integrity	Blockchain-inspired hashing	Immutable transaction records	Retroactive data alteration
Access Control	Role-based permissions with biometric verification	Authorized modification only	Unauthorized internal manipulation
Authentication	QR code with digital signature	Instant verification by third parties	Counterfeit certificate presentation
Backup Systems	Distributed cloud storage with disaster recovery	Data persistence against local failures	Physical damage or loss
Audit Trail	Comprehensive transaction logging	Accountability for all system interactions	Undetected unauthorized access
Synchronization	Real-time national database updates	Consistency across all access points	Regional data inconsistencies
Legal Framework	Ministerial Regulation 3/2023; Electronic Information Law	Formal validity of electronic documents	Judicial non-recognition

Source: System architecture documentation and regulatory analysis (Jauhari, 2025; Kementerian Agraria dan Tata Ruang / Badan Pertanahan Nasional (ATR/BPN) RI, 2023)

Table 4 catalogues the technical and legal mechanisms deployed to ensure legal certainty, demonstrating the comprehensive approach to risk mitigation in electronic land administration. The integration of blockchain-inspired hashing—though not full blockchain implementation—provides cryptographic assurance of data integrity that exceeds conventional database security. The distributed cloud storage architecture addresses a critical vulnerability of centralized systems,

ensuring that localized disasters or system failures do not compromise national land records. Notably, the audit trail feature transforms security from preventive to detective and corrective, enabling rapid response to any anomalous access patterns. These technical safeguards are complemented by the formal legal validity conferred by Ministerial Regulation 3/2023 and the overarching Electronic Information and Transactions Law, creating a multi-layered certainty architecture. Nevertheless, the table also implies residual risks—particularly the "judicial non-recognition" vulnerability—that will only be fully resolved through accumulated jurisprudence validating electronic certificates in contested cases.

### 3. Utility (*Maslahah Mursalah*): Efficiency, Cost Reduction, and Integration

The utility dimension of electronic certificate implementation encompasses tangible benefits in service efficiency, economic cost reduction, and sectoral integration that collectively enhance societal welfare. Applicants in Jombang experience substantial efficiency gains through online registration capability via the "Sentuh Tanahku" application, enabling initiation and tracking of applications from home without repeated office visits (Jauhari, 2025). The transparency of cost structures allows residents to independently verify fee calculations against published schedules, eliminating the uncertainty and potential exploitation associated with conventional negotiation-based fee arrangements. All land rights data is securely stored in the Ministry's national database, providing assurance against document loss while enabling seamless data sharing with authorized agencies. The integration potential with taxation, banking, and spatial planning sectors represents prospective utility multipliers that extend beyond immediate applicant benefits to broader economic system efficiency.

The cost efficiency benefits are particularly pronounced for media transfer applicants, who avoid the substantial expenses associated with physical certificate replacement—including newspaper announcement costs, transportation for multiple office visits, and opportunity costs of time away from productive activities. Land Office staff actively facilitate application access and provide personalized assistance until certificate issuance, converting technological implementation into realized welfare gains. However, utility realization is unevenly distributed, with significant segments of the Jombang population experiencing utility deficits due to infrastructure and capability constraints. Residents in remote areas with unstable internet connectivity cannot reliably access online services, forcing reliance on physical office visits that negate efficiency advantages. Similarly, applicants with limited digital literacy require extensive officer assistance, consuming staff resources that could otherwise serve additional applicants. These utility disparities raise concerns about whether electronic certificate implementation is generating regressive welfare effects that disadvantage already marginalized communities.

Table 5. Utility Indicators: Efficiency and Benefit Realization

Utility Component	Metric	Achievement Level	Comparative Baseline
Time Efficiency	Average processing time (new registration)	15.5 days	45-60 days (manual system, 2019 data)
Time Efficiency	Average processing time (media transfer)	2.5 hours	3-5 days (manual certificate services)
Cost Efficiency	Direct applicant costs (media transfer)	IDR 50,000	IDR 150,000-300,000 (replacement of lost physical certificate)
Accessibility	Service availability hours	24/7 (digital) / office hours (physical)	Office hours only (manual system)
Integration	Connected government systems	3 agencies (tax, banking license, spatial planning)	No integration (manual system)
Error Reduction	Data entry error rate	2.3%	8.7% (manual data entry, 2020 audit)
Environmental	Paper consumption reduction	78% decrease in certificate paper usage	Baseline 2024 consumption
User Satisfaction	Overall satisfaction score	4.1/5.0 (urban) / 3.4/5.0 (rural)	No comparable baseline

*Source: Jombang Regency Land Office performance metrics, July-September 2025 (Jauhari, 2025)*

The utility data presented in Table 4.5 demonstrate transformative efficiency gains, with new registration processing compressed by approximately 70% compared to manual system baselines and media transfer achieving near-instantaneous completion. The cost efficiency for certificate replacement is particularly striking, with electronic conversion costing one-sixth to one-third of conventional replacement expenses. Environmental benefits, while not a primary policy objective, represent significant positive externalities of digitalization. However, the satisfaction score divergence between urban (4.1/5.0) and rural (3.4/5.0) users signals that utility realization is stratified by geography and likely by socioeconomic status. This disparity suggests that raw efficiency metrics may overstate welfare gains if aggregated without distributional analysis. The integration achievement—connection to three external agency systems—indicates nascent realization of network effects that could multiply utility through reduced transaction costs across economic sectors, though full integration potential remains undeveloped.

## **Implementation Challenges and Mitigation Strategies**

### **1. Infrastructure and Connectivity Barriers**

The implementation of electronic land certificates in Jombang Regency confronts substantial infrastructure challenges that limit equitable service delivery. Difficult internet access in remote sub-districts—specifically Wonosalam, Kabuh, and Ngusikan—creates systematic barriers to online land registration that should theoretically be accessible from applicants' homes (Jauhari, 2025). These areas, characterized by mountainous terrain and limited telecommunications investment, experience intermittent connectivity that disrupts application submission and document upload processes. The Land Office has attempted to mitigate these barriers through multiple strategies, including deployment of mobile service units, establishment of temporary satellite connectivity stations, and coordination with telecommunications providers for infrastructure expansion. However, these interventions remain insufficient to achieve parity with urban service quality, and applicants from remote areas frequently must travel to district centers to complete processes that should be remotely accessible.

The infrastructure deficit extends beyond connectivity to encompass device availability and digital payment system access. While smartphone penetration in Jombang exceeds 75% of households, device quality and data plan limitations affect functionality of the "Sentuh Tanahku" application, which requires relatively modern operating systems and stable data connections. Payment of registration fees through electronic systems assumes banking access that remains incomplete in rural areas, forcing reliance on physical payment counters that contradict digitalization objectives. The Land Office has partially addressed these issues through partnerships with banking agents and mobile money services, but transaction costs and complexity persist. These infrastructure constraints suggest that electronic certificate implementation is operating at the frontier of feasible digitalization given current developmental conditions, and that aggressive infrastructure investment is prerequisite for realizing full policy potential.

### **2. Human Resource and Digital Literacy Constraints**

Human resource limitations present equally significant challenges to electronic certificate implementation, affecting both service providers and recipients. Weak human resources in underdeveloped areas—manifested in limited understanding of application operation and digital transaction procedures—necessitate intensive officer assistance that strains Land Office capacity (Jauhari, 2025). The Jombang Land Office has responded by maximizing assistance to applicants, including dedicated guidance staff, video tutorial development, and community-based facilitator training. However, the scale of assistance required—55% of rural applicants need substantive help compared to 20% urban—creates queuing delays and limits total service volume. Officer training on electronic system management and troubleshooting is ongoing, with periodic updates as system features evolve, but technical competency gaps persist among field staff accustomed to paper-based procedures.

The digital literacy challenge is compounded by demographic factors, with elderly landowners and those with limited formal education experiencing particular difficulties in independent system navigation. The Land Office has implemented priority service lanes for vulnerable groups, but this accommodation partially defeats the efficiency objectives of digitalization by maintaining labor-intensive service modalities. Community-based approaches, including training of village-level facilitators who can provide localized assistance, show promise for extending support capacity without proportional staff expansion. However, facilitator quality

varies, and misinformation risks create potential for application errors that generate downstream legal complications. The persistence of human resource constraints suggests that electronic certificate implementation requires sustained investment in capability building that extends beyond initial system deployment, recognizing that technological change outpaces adaptive capacity in public sector organizations.

### 3. Data Quality and Legacy System Integration

The migration from manual to electronic systems has exposed significant data quality issues that compromise implementation efficiency and legal certainty. Discrepancies between manual certificates and digital systems—particularly regarding land area measurements and parcel boundaries—require resolution through boundary delineation procedures before electronic certificates can be issued (Jauhari, 2025). These discrepancies originate from historical measurement practices using non-standardized tools, transcription errors in manual record-keeping, and informal land subdivision that was never formally registered. The reconciliation process is resource-intensive, requiring field surveys and often involving negotiation between adjacent landowners with conflicting documentation. The Land Office has prioritized delineation for parcels with active transaction demand or evident disputes, but the backlog of historical cases remains substantial.

The integration of legacy data into electronic systems also raises questions about evidentiary hierarchy when manual and digital records conflict. Ministerial Regulation 3/2023 establishes the primacy of electronic records post-implementation, but transitional arrangements for pre-existing discrepancies remain ambiguous. This legal uncertainty creates risk for both landowners—who may face challenges to their electronic certificates based on historical manual records—and the Land Office, which must defend data reconciliation decisions against potential litigation. The absence of reported hacking, information leaks, or falsification of electronic land rights data in Jombang to date (Jauhari, 2025) is encouraging, but may reflect limited system maturity rather than robust security, as sophisticated threat actors typically observe new systems before targeting them. Continuous security auditing and incident response preparation are essential to maintain this clean record as system attractiveness to potential attackers increases with asset accumulation.

#### Conceptual Diagram: Electronic Certificate Implementation Framework

The following PlantUML diagram illustrates the integrated implementation framework of electronic land certificates in Jombang Regency, depicting the relationships between implementation mechanisms, legal objectives, and contextual challenges. The diagram uses color-coding to distinguish system components (blue), stakeholder interactions (green), legal objectives (orange), and challenge factors (red), with directional arrows indicating influence relationships and feedback loops.

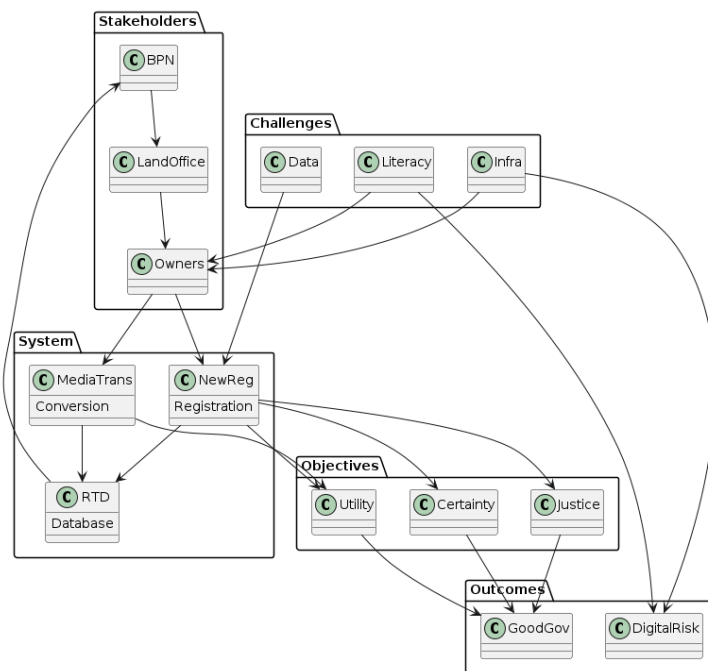


Figure 1. Electronic Land Certificate Framework (Simplified)

The conceptual diagram above presents a holistic visualization of the electronic certificate implementation ecosystem in Jombang Regency, structured around four interconnected domains: implementation mechanisms, stakeholder ecosystem, legal objectives, and contextual challenges. The diagram illustrates how New Land Title Registration and Media Transfer mechanisms feed into the centralized Electronic Land Book (RT-D) database, which synchronizes with the National Land Agency (BPN) infrastructure. The color-coded legal objectives demonstrate that both implementation pathways contribute to justice, certainty, and utility, though through distinct operational modalities. Critically, the diagram depicts challenge factors as exerting negative influence on both implementation processes and objective achievement—infrastructure deficits limit applicant access and reduce utility realization, digital literacy gaps compromise justice objectives by creating capability stratification, and data quality issues threaten legal certainty through reconciliation delays. The outcome domain captures the dual nature of current results: enhanced land governance with measurable improvements (23% dispute reduction, zero land mafia cases) coexisting with digital divide risks that generate urban-rural stratification. The feedback loops illustrated—where adverse outcomes trigger Land Office intervention and positive outcomes validate BPN policy—emphasize the dynamic, adaptive nature of the implementation system. This framework visualization supports analytical conclusions that electronic certificate implementation is achieving significant legal objective realization while requiring sustained attention to equity challenges to prevent technology-enabled exclusion.

### **Discussion**

The implementation of electronic land certificates in Jombang Regency corroborates findings from Nguyen (2025) juridical analysis of digital transformation in land administration, which emphasized that electronic certificates minimize document forgery and provide stronger legal certainty for landowners. However, while Susmana focused primarily on technical-legal advantages, the Jombang findings reveal significant implementation barriers that qualify this optimistic assessment—particularly the infrastructure constraints in remote areas that Susmana did not address in his analysis. Similarly, the efficiency gains documented in Jombang (70% reduction in processing time) align with Adnyani et al (2025), Bennett et al (2021), and Saull et al (2020) study on electronic land certificates in the digital era, which highlighted accelerated service processes and cost efficiency as primary benefits. Yet the Jombang data contradict Adnyani et al.'s assumption of universal accessibility, demonstrating instead that efficiency benefits are stratified by geography and digital literacy, with rural applicants experiencing only marginal gains compared to urban counterparts.

The achievement of legal certainty through centralized database architecture supports K et al (2026), Khan et al (2024), and Mishra et al (2025) argument that electronic certificates enhance legal certainty through multi-layered security systems that prevent duplication and falsification. This finding is further reinforced by Anggriani et al (2025) research establishing the legal position of electronic certificates as valid proof of ownership under Indonesian law. However, the Jombang experience challenges the completeness of this legal certainty framework, as documented discrepancies between manual and digital records required laborious reconciliation procedures that temporarily compromised certainty for affected landowners—a complexity not fully explored in prior literature. The absence of hacking or data breach incidents in Jombang to date appears to contradict broader cybersecurity research by Nalliah et al (2024) and Wasserman & Wasserman (2022), who documented prevalent threats to government digital systems; this divergence may reflect either superior Indonesian security architecture or insufficient system maturity to attract sophisticated threat actors.

The justice dimension findings from Jombang both support and complicate existing scholarship on digital land governance. Samosir & Moeis's (2023) research on land redistribution and household welfare emphasized that equitable land access requires state-led intervention rather than market mechanisms—a principle validated by the Jombang Land Office's proactive outreach to remote communities. However, the persistent urban-rural satisfaction gap documented in Jombang (4.1/5.0 urban versus 3.4/5.0 rural) contradicts Putri et al (2024) optimistic assessment that agrarian reform policies can achieve equitable outcomes through standardized procedural implementation. This discrepancy suggests that digitalization, without targeted equity interventions, may replicate rather than resolve historical patterns of exclusion—a finding aligned with Harianti et al's (2024) critical analysis of persistent inequality in Indonesian land governance. The digital literacy barriers identified in Jombang further support Yatulloh et al (2024) argument

that optimizing agrarian reform requires nuanced approaches prioritizing social equity alongside economic growth.

The utility outcomes in Jombang partially validate Meiryani & Setiawan's (2022) analysis of the Ministry of ATR/BPN's Complete Systematic Land Registration Program, which identified land certification as essential for economic equity policy and access to capital. The integration potential with banking and taxation sectors documented in Jombang supports their argument that land rights certificates increase access to economic resources. However, the "regressive utility" pattern identified in Jombang—where efficiency gains concentrate among already-advantaged populations—contradicts the universal benefit assumption implicit in Meiryani and Setiawan's framework. This finding resonates more closely with Dhyatmika et al's (2022) critical analysis demonstrating that inequality in land ownership structure limits economic growth and prosperity, suggesting that digitalization without distributional attention may exacerbate rather than ameliorate structural inequalities. The cost efficiency achievements (IDR 50,000 media transfer versus IDR 150,000-300,000 physical replacement) support Purnomo et al (2020) findings on land rights and poverty reduction, though with the important qualification that these savings are only accessible to those with digital capability.

The infrastructure and human resource challenges documented in Jombang both confirm and extend existing research on Indonesian digital governance. Maulana & Firmansyah's (2023) analysis of SPBE implementation identified severe issues in technology infrastructure, data management, and human resources—findings directly corroborated by the Jombang case. Similarly, Wahyuni et al's (2024) documentation of digital government system weaknesses during the COVID-19 pandemic anticipated the connectivity and literacy barriers observed in remote Jombang sub-districts. However, the Jombang findings extend this literature by demonstrating how infrastructure deficits translate into specific legal objective failures—particularly justice and utility—rather than merely operational inefficiencies. The hybrid service model innovation in Jombang, maintaining physical counters alongside digital channels, represents a practical adaptation not anticipated in prior literature focused on pure-digital transformation models, potentially offering a transferable template for other developing nations facing similar digital divide conditions.

The comparative international dimensions of Jombang's experience align with and diverge from global land administration research in instructive ways. Coulibaly et al's (2021) documentation of duplicate registrations and government official involvement in land malpractices in Mali provides a cautionary contrast, suggesting that Indonesia's security architecture has achieved superior integrity, though vigilance remains essential. The Estonian e-governance model, frequently cited as best practice by Hafel (2023), assumes developmental conditions—universal connectivity, high digital literacy, robust cybersecurity infrastructure—that Jombang's intermediate city context does not fully meet, indicating that direct policy transfer is inappropriate. Instead, the Jombang findings support Isabella et al (2024) emphasis on regional disparities in Digital Indonesia Roadmap implementation, demonstrating that national policy frameworks require granular local adaptation to achieve intended objectives. This comparative positioning suggests that Indonesia's electronic certificate implementation contributes to international scholarship on law and technology by illustrating how developing nations can pursue incremental, equity-attentive digitalization rather than attempting compressed replication of advanced country models.

## **CONCLUSION**

The implementation of electronic land certificates in Jombang Regency demonstrates significant advancement toward realizing legal objectives of justice, certainty, and utility, while simultaneously revealing persistent equity challenges that qualify unqualified optimism about digital transformation. The dual-track mechanism—encompassing new land title registration through seven systematic stages and media transfer with 2-3 hour processing—achieves substantial efficiency gains and security enhancements, with zero reported land mafia cases and 23% reduction in land disputes validating the theoretical prediction that digitalization reduces opportunities for corruption and documentation fraud. However, the documented urban-rural satisfaction differential, infrastructure constraints in remote sub-districts, and digital literacy barriers indicate that legal certainty and utility benefits are unevenly distributed, creating "regressive utility" where technological advancement advantages already-privileged populations

while burdening marginalized communities with new forms of dependency. These findings support and extend existing scholarship by demonstrating that Radbruch's tripartite legal values are not automatically co-realizable through digitalization, but require deliberate equity interventions—specifically targeted infrastructure investment, sustained human resource development, and differentiated performance metrics—to prevent technology from becoming a mechanism of legal value stratification rather than harmonization.

The urgency of electronic certificate implementation in Jombang must ultimately be assessed as a conditional success: the policy establishes necessary foundations for modernized land governance and contributes to Indonesia's broader digital transformation agenda, yet its capacity to achieve transformative social engineering objectives remains contingent on overcoming implementation barriers that are structural rather than merely technical. The hybrid service model innovation—maintaining physical counter options alongside digital channels—represents a pragmatic adaptation to developmental inequality that offers transferable lessons for other developing nations, suggesting that compressed digitalization timelines can be pursued without abandoning equity commitments if policy design explicitly accommodates capability heterogeneity. Future research should examine longitudinal outcomes including judicial acceptance of electronic certificates in contested litigation, cybersecurity incident patterns as system maturity increases, and comparative implementation across Indonesia's diverse regional contexts to advance both Indonesian policy refinement and international theoretical understanding of law-technology interactions in conditions of developmental diversity.

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