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The Challenges and Prospects of Electronic Land Certification in Indonesia

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Abstract

This article investigates the implementation of electronic land certification in Indonesia, focusing on identifying challenges and conducting an analysis of this process. Using a qualitative approach and literature review, this research analyzes information from various documents on land certification issues in Indonesia and forms secondary sources of information from literature reviews, including scientific articles, government reports, and case studies from other countries that have implemented a certification system electronic land. The thematic analysis highlights three presidential directions in the digital transformation of land administration: simplifying applications and platforms, accelerating the implementation of the Electronic Based Government System (SPBE), and integrating land services into the National Portal. These steps aim to improve the efficiency, transparency, and responsiveness of public services and overcome challenges such as system complexity, data duplication, and limited access to information.

This research also reveals that electronic land certification significantly benefits modernizing land services in Indonesia, including accelerating land registration, increasing data accuracy and security, and contributing to Non-Tax State Revenue (PNBP) of IDR 3 trillion from the land sector in 2023. However, technical issues such as the digital divide and cybersecurity issues have to be addressed to ensure complete implementation success. Apart from technical challenges, social and cultural aspects are also the focus of this research. Low digital literacy and resistance to change must be overcome through public education about the long-term benefits of electronic land certification and increasing digital literacy. The electronic land certification program in Indonesia will be very prospective in the future and will become the main milestone of the digital transformation of modern land administration and services in Indonesia. The future prospects of the electronic land certification program in Indonesia are bright, with significant benefits in terms of efficiency, security, and data management. However, addressing the challenges related to infrastructure, training, public awareness, and legal frameworks will be crucial for the successful nationwide implementation of this program.

Keywords*:* electronic land certification, legal ambiguity, technological infrastructure, digital literacy, blockchain, land administration, digital transformation.

Introduction

Digital transformation in land administration in Indonesia is an important agenda in line with technological developments and the public's need for more efficient and transparent services. The electronic land certification program is one of the strategic initiatives that will answer this challenge (Negara et al., 2021). Electronic certification is expected to overcome various problems in conventional land administration, such as processing delays, data security, and physical records management.

Current conditions indicate a significant increase in land title certificates issued. However, this increase needed to be matched by adequate human resources, resulting in delays in completing work. Digital transformation through electronic certification can speed up this process by reducing dependence on manual processes (Rifai et al., 2022). Electronic systems allow automation of many stages in certificate issuance, from data validation to document authentication.

In addition, many land offices in Indonesia face serious problems related to storing physical records. Fires, floods and improper storage conditions often cause damage or loss of important documents. Electronic certification offers a solution by storing data in digital form that is safer and easier to access (Sutirman, 2020). Data stored electronically is more resistant to physical disasters and can be protected with various digital security technologies.

Data security is a crucial aspect of land administration. Electronic certification allows the application of encryption and digital signature technologies that increase document security. Each electronic certificate is equipped with a QR code and electronic signature, which guarantees the authenticity and integrity of the document (Prasetya, 2022). In this way, the risk of forgery or illegal changes can be minimized, providing stronger legal certainty for land rights holders.

Modernization of land services through electronic certification has also proven effective in various countries. Finland, Poland and several other countries have succeeded in improving the efficiency and accuracy of their land services through electronic systems (Hadi, 2022). Experience from these countries shows that digital transformation simplifies administration and increases public trust in government services.

Another benefit of electronic certification is saving physical archive storage space. In a conventional system, each land office must provide a large enough space to store physical documents. With an electronic system, all data can be stored on a server or cloud storage, which is more efficient and easy to access. This not only reduces the need for physical space but also reduces operational costs associated with managing records.

The President's instruction to encourage the massive implementation of electronic certification shows the government's commitment to modernizing public services. This policy is followed by various regulations that support the implementation of electronic certification, such as Minister of ATR/KBPN Regulation Number 3 of 2023 (Permana et al., 2024). This regulation provides a strong legal basis for implementing electronic certificates and ensures this process is carried out to a high standard.

In a broader context, electronic certification is part of the government's efforts to increase the quality of public services by implementing an Electronic Based Government System (SPBE). This program simplifies bureaucracy, increases transparency, and speeds up public services. It is hoped that electronic certification can become a model for digitalising other public services in Indonesia.

The benefits of electronic certification are felt by the government and society. Landowners will get faster and more transparent service, with easier access to land information. This is expected to increase legal certainty and encourage investment in the property sector. With better services, the public will also have more trust and support for government programs in land management.

Overall, electronic land certification is a step forward in Indonesia's digital transformation of land administration. This program not only overcomes various problems in the conventional system but also opens up opportunities for improving more efficient, safe and transparent services. With strong regulatory support and commitment from the government, electronic certification is expected to bring significant positive changes to land management in Indonesia.

I. METHODS

This research applies a qualitative approach with a literature review and study method to identify and analyze challenges in implementing electronic land certification in Indonesia (Musadad & Marbun, 2024). Information will be collected and analyzed through literature review, observation and document study, such as government reports and related regulations and documentation of the electronic land certification process in several regions in Indonesia. Literature review and observation will allow researchers to gain a direct understanding of the processes and challenges that occur in the field.

In addition, further information will be collected through literature reviews, which include scientific articles and government reports (Ibrahim & Triadi, 2024), related regulations, as well as case studies from other countries that have successfully implemented electronic land certification (Lina, 2023). This literature review aims to understand the global and local context of electronic land certification and to identify best practices that can be adapted in Indonesia.

Data analysis used thematic analysis techniques to identify main patterns and themes from observation data and literature. This approach allows researchers to dig deeply into critical issues emerging from the data and understand the complexity of the challenges (Rejekiningsih, 2016). The results of this analysis will then be compared with the findings from the literature review to identify gaps and propose relevant recommendations for policy and practice in Indonesia.

II. RESULTS AND DISCUSSION

A. Direction of the President of the Republic of Indonesia

The three directives of the President of the Republic of Indonesia in the priority work program for digital transformation aim to accelerate the modernization of land services through the implementation of electronic land certification (Indonesia, 2020). The first direction is simplifying applications and platforms used in land administration. With so many currently available applications, data is often duplicated and needs to be clarified, and clarity is needed when managing information. This simplification aims to reduce system complexity, make the administration process more efficient, and make access easier for users (DAN, n.d.). Well-integrated applications and platforms enable various government agencies to share data and information in real time, reducing workload and increasing productivity.

The second direction is accelerating the implementation of the Electronic-Based Government System (SPBE). SPBE is designed to replace slow, error-prone manual processes with faster, more accurate and more reliable digital systems (Hidayah & Almadani, 2022). Implementing SPBE allows the automation of many stages in issuing land certificates, from data validation to document validation. This speeds up the administration process and improves data accuracy and security. With SPBE, the government can ensure that every process is carried out efficiently and transparently, providing a strong basis for better analysis and decision-making.

The third direction is the integration of land services with the National Portal. The National Portal is the main gateway for the public to access various government services, including land services. This integration allows people to get the necessary information and services through one well-organized platform (Hardjaloka, 2014). This not only increases user convenience but also increases government transparency and accountability. With the National Portal, all data and digital services can be accessed easily, providing a smoother and more efficient user experience.

The implementation of electronic land certification through three Presidential directives is a strategic step aimed at creating a public service ecosystem that is more modern, efficient and responsive to community needs. This digital transformation is expected to overcome various challenges in land administration, such as the high volume of services and limited human resources, as well as data security and validity issues. With strong regulatory support and commitment from the government, electronic land certification can bring significant positive changes to land management in Indonesia, improve the quality of public services, and provide broad economic benefits.

B. Complete Systematic Land Registration Program (PTSL)

The Complete Systematic Land Registration Program (PTSL), which started in 2017, aims to map and to register all 126 million plots of land in Indonesia systematically and completely. PTSL is an important step in efforts to reform bureaucracy and modernize land administration in Indonesia (AM, 2019). By creating a comprehensive land database for all regions of Indonesia, this program is the foundation for digital transformation in land administration. This database makes implementing electronic land certification more

efficiently and transparently easier. With electronic certification, the land administration process becomes faster, more accurate and safer, reducing the risk of loss and damage to physical records due to natural disasters or poorly maintained office conditions (Investment & Investment, 2022). Electronic certification enables better integration of data and information, ensuring that all land data can be accessed in real time by various relevant agencies. This, in turn, improves coordination and efficiency in land management.

In addition, electronic certification supports government efforts to increase the quality of public services. With a faster and more transparent process, people can easily process their land certificates without facing complicated bureaucracy. This saves time and costs and increases public confidence in the land administration system. (Kusmiarto et al., 2021). Furthermore, the legal certainty of land ownership provided by electronic certificates encourages economic growth because the public and investors feel safer carrying out property transactions.

The PTSL program has shown positive results, significantly increasing certified lands. This also contributed to substantially increased Non-Tax State Revenue (PNBP) from the land sector. This success shows that digital transformation in land administration through PTSL and electronic certification is an effective strategic step in responding to the challenges of modernization and bureaucratic reform in Indonesia. This program increases efficiency and transparency and plays an important role in supporting sustainable and inclusive economic development.

C. Accelerating Digitalization for an Integrated Indonesia

The main goal of accelerating digitalization in land administration is to simplify the applications and platforms used (Azizah, 2023). The large number of applications currently available often causes confusion and data duplication, which ultimately slows down the administration process. All processes can be integrated into a more efficient and user-friendly system by simplifying applications and platforms. This simplification reduces the workload on employees and increases accessibility for people who need land services so that every individual can easily get information and take care of their land interests without facing unnecessary obstacles.

The next important step in this digital transformation is accelerating the implementation of the Electronic Based Government System (SPBE). SPBE is designed to modernize government bureaucracy by adopting digital technology in every operational aspect. Faster implementation of SPBE will speed up the administrative processes and increase the efficiency of public services. This system allows the government to automate various routine tasks, reduce human error, and ensure every process is carried out most efficiently and transparently (Awaludin, 2019). With SPBE, data and information can be managed more structured and integrated, providing a strong basis for better analysis and decision-making.

Integration into the National Portal is a strategic move aimed at centralizing all government digital services in one easy-to-access platform. The National Portal will be the public's main gateway to various government services, including land services (AS & SH, 2024). With this integration, people will no longer need to visit different websites or

applications to get the needed information or services. All relevant services and data will be available in one well-organized portal, providing a smoother and more efficient user experience. This will not only increase convenience for users but also increase government transparency and accountability.

Accelerating digitalization by simplifying applications/platforms, accelerating the implementation of SPBE, and integrating it into the National Portal aims to create a public service ecosystem that is more modern, efficient, and responsive to community needs. With a more integrated and easily accessible system, administrative processes become faster and more accurate, reducing excessive bureaucracy and improving the quality of public services. These steps will likely provide significant benefits for society and the government, creating a more transparent and accountable environment and encouraging innovation in the provision of public services. Through this digital transformation effort, Indonesia can realize its vision of becoming a country with the best public services in the world, capable of meeting people's needs quickly and efficiently.

D. Modernization of Electronic Land Services

Countries such as Macedonia, the Kyrgyz Republic, Finland, and Poland have become examples of success in the electronic modernization of land registration and land data maintenance. They have integrated digital technology into their land administration systems, which speeds up the registration process and increases data accuracy and security (Silviana, 2021). Seeing this success, Indonesia has decided to take similar steps by implementing electronic land certification as part of digital transformation in land administration. This step aims to overcome various challenges that conventional systems have faced, such as processing delays, data security, and physical archive management.

In 2023, Indonesia recorded a significant achievement with Non-Tax State Revenue (PNBP) of IDR 3 trillion from the land sector. These figures demonstrate the initial success of implementing electronic certification and encourage the continued expansion of digital technology in land administration (Rahayu, 2020). Electronic certification enables the automation of many stages in land registration, from data validation to document attestation, significantly reducing the time and costs required. In addition, with an electronic system, data can be managed and accessed more efficiently, reducing the risk of human error and increasing public confidence in the land system.

With a total of ± 111 million plots of land registered and ± 90.9 million certified, Indonesia has a big challenge in ensuring that every plot of land is registered and certified accurately and transparently. Electronic land certification provides an effective solution to this challenge (Yudhoyono, 2024). Data stored electronically is more resistant to physical damage and is more easily accessible, both by the government and the public. Technologies such as encryption and digital signatures increase data security and integrity, ensuring that every land document is authentic and cannot be altered illegally. Thus, electronic certification increases administrative efficiency and provides stronger legal protection for landowners.

Digital transformation in land administration in Indonesia is a strategic step toward creating a more modern, efficient system responsive to community needs. Implementing electronic

certification is expected to accelerate the land registration process, improve the quality of public services, and provide significant economic benefits. With strong regulatory support and commitment from the government, Indonesia is ready to utilize technology to offer land services that are reliable, transparent and simple to access. This effort will increase public confidence in the land system and encourage investment in the property sector, ultimately contributing to national economic growth.

E. Technical and Infrastructure Challenges

1) Technology Infrastructure

Technological infrastructure is a vital component in implementing electronic land certification in Indonesia. Currently, the digital divide is the main challenge, especially in rural areas with minimal internet access. To support the success of electronic certification, a stable internet network and adequate hardware are needed in all regions. In addition, investment in information and communications technology (ICT) must be increased, including providing reliable servers and secure software (Irfan et al., 2023; Kusmayadi & Hum, 2015).

Cybersecurity is also an important aspect of the technological infrastructure for electronic land certification. The system must be able to protect data from potential threats of hacking and manipulation. Training for human resources involved in digitalization is also crucial to ensure system operations run smoothly and effectively. A strong technological infrastructure ensures efficiency and builds public trust in the electronic certificate system (Nainggolan et al., 2023).

With adequate technological infrastructure, registering, verifying and managing land data can be carried out more efficiently and safely. This will encourage the public to accept and trust the electronic certificate system more. The government needs to continue to invest in technological infrastructure to ensure that digital transformation in land administration can be achieved optimally (Hapsari et al., 2022).

2) Data Integrity and Security

Indonesia is undergoing a significant digital transformation in various aspects of life, including land administration. One important innovation that is in the spotlight is electronic land certification. The challenges faced in the implementation of electronic land certification in Indonesia are quite complex, but the prospects are promising.

The main challenge lies in the information technology infrastructure, which is not evenly distributed throughout Indonesia. In remote and underdeveloped areas, internet access still needs to be improved, which hampers digitalization. Apart from that, resistance to changes from manual to digital systems is still quite strong, especially among people used to conventional processes. (Permadi, 2023). This is exacerbated by the low level of digital literacy among most of the population, making education and outreach about electronic land certification crucial. However, the prospects for electronic land certification are very bright. With proper implementation, electronic land certification can increase efficiency and transparency in land administration

(Salma, 2021). Processes that previously took a long time and were prone to corrupt practices can be simplified and monitored more closely. Using blockchain technology, for example, can ensure data security and reduce the risk of forgery of land certificates. Electronic land certification also supports government programs in realizing good governance and more responsive public services.

The Indonesian government has shown a strong commitment to realizing this transformation through various initiatives and policies, such as issuing a Minister of Agrarian and Spatial Planning/Head of National Land Agency Regulation, which regulates electronic certificates. Training and capacity-building programs are also continuously promoted to ensure all stakeholders are ready to face this digital era.

D. Social and Cultural Challenges

1) Public Awareness and Education

Public awareness and education are key to implementing electronic land certification in Indonesia. In digital transformation, public education is essential to ensure a smooth transition from manual to digital systems. The main challenge lies in the low level of digital literacy among most of the population, especially in remote and underdeveloped areas. People less familiar with digital technology often feel reluctant and sceptical about these changes, so intensive efforts are needed to increase their understanding. One effective strategy can be implemented through a comprehensive outreach and training program. In collaboration with the private sector and educational institutions, the government can organize workshops, seminars and educational campaigns that focus on the importance of electronic land certification and how to use it. These programs aim to provide technical knowledge and build awareness of the long-term benefits of digitizing land titles, such as increased efficiency, transparency and security in land administration (Krismantoro, 2023; Permadi, 2023).

To overcome this challenge, a comprehensive outreach and training program is needed. In collaboration with the private sector and educational institutions, the government can organize workshops, seminars and educational campaigns that focus on the importance of electronic land certification and how to use it. These programs should be designed not only to provide technical knowledge but also to build awareness of the long-term benefits of digitizing land titles, such as increased efficiency, transparency, and security in land administration (Long et al., 2021).

The government can also utilize mass media and digital platforms to disseminate information widely and quickly. Social media, official websites, and mobile applications can be an effective tool for reaching various levels of society. Interesting and easy-to-understand educational content, such as infographics, video tutorials and FAQs, can help the public understand the process and benefits of electronic land certification.

2) Digital Literacy

Digital literacy is a crucial component in implementing electronic land certification in Indonesia. Not all members of the Indonesian population are adept at using internet-based information and communication technology(Irfan et al., 2023). Efforts to improve

digital literacy, especially in rural areas, will be crucial. The main challenge faced in this effort is the low level of digital literacy among the community, especially in remote and underdeveloped areas. Many people who have not become familiar with digital technology find it difficult to understand and adopt this new system. Apart from that, resistance to changes from manual to digital systems is still strong, considering that many people feel comfortable with the traditional methods they have used for a long time (Aksenta et al., 2023).

To overcome this challenge, increasing digital literacy must be a priority. The government can organize various training and education programs to improve people's digital skills. These programs should cover basic knowledge about using digital devices, accessing and managing information online, and the benefits of electronic land certification. Social media and other digital platforms can be utilized to disseminate information and tutorials about electronic land certification.

The prospects for increasing digital literacy are very positive. With a better understanding of digital technology, society will be better prepared and open to innovation in land administration. They will see the real benefits of electronic land certification, such as increased efficiency, transparency and data security. This will speed up the land certification process and reduce the potential for disputes and corrupt practices in land administration (Long et al., 2021).

E. Administrative and Operational Challenges

1) Legal and Regulatory Framework

The future of the program will also depend on the continued development and refinement of the legal and regulatory framework. The current foundation, including Ministerial Regulation No. 1 of 2021 on Electronic Certificates, provides a sufficient starting point, but eventually it may need stronger legal foundations to evolve as the system expands and new challenges emerge(Krismantoro, 2023).

2) Human Resources

Human resources are vital in facing administrative and operational challenges in electronic land certification in Indonesia. One of the main challenges is the need for workforce readiness and skills in operating complex digital systems. Many employees at the land office are still used to manual systems, so the transition to a digital system requires a significant increase in capacity. Training and skills development are essential to ensure that staff can use new technology effectively and efficiently(Rizka, 2023; Setkab, 2023).

Apart from that, resistance to change is also an obstacle. Some employees may feel threatened by digitalization, which will likely reduce their role in land administration. Therefore, there is a need for a holistic approach to change management, which includes technical training, motivation, and psychological support to encourage the adoption of new technologies (Masdar et al., 2009).

However, this challenge also opens up great opportunities for improving the quality of human resources. With the right training, employees can gain new skills that are

useful not only for their current jobs but also increase their competitiveness in an increasingly digital job market. Governments and educational institutions can work together to design relevant curricula and provide certification programs to ensure that employees have widely recognized credentials.

Additionally, digitizing land administration can speed up work processes and increase data accuracy (Erfa, 2020), This digital transformation reduces administrative workload and allows employees to focus on more strategic tasks. Thus, it benefits society in the form of faster and more transparent services and employees who can work more efficiently and productively(Kusmiarto et al., 2021).

3) Procedural Delays

Procedural delays are one of the significant challenges in implementing electronic land certification in Indonesia (Al Fawwaz, 2019). The long-established manual system often makes the land certification process slow and bureaucratic. Digital transformation through electronic land certification is expected to overcome this problem by reducing the time required and increasing process efficiency.

However, the transition process to an electronic system takes work. The main challenge is adapting and integrating all complex manual procedures into a digital system (Fonna, 2019). Multi-layered and often inefficient procedures must be evaluated and simplified before they can be automated. This requires close collaboration between various government agencies and stakeholders to redesign these processes better to suit the new digital system.

One effort to overcome procedural delays is to improve coordination between institutions and apply the principles of good governance. Using sophisticated information technology, electronic land certification can speed up the land data verification and validation process, thereby reducing applicants' waiting time. Implementing blockchain technology, for example, can help ensure the security and integrity of data, thereby minimizing the risk of errors and fraud (Susilo, 2023).

The prospects for eliminating procedural delays through electronic land certification are very positive. A faster and more efficient process will increase public satisfaction with public services and support a better investment climate by providing legal certainty over land ownership. This will ultimately contribute to more inclusive and sustainable economic growth.

F. Prospects

The future prospects of the electronic land certification program in Indonesia appear promising, though there are still some challenges to overcome. Here is an overview of the benefits:

1. **Increased Efficiency and Transparency**

   The implementation of electronic land certificates is expected to significantly improve the efficiency and transparency of land registration and management in Indonesia. According to a study published in the Digital Evidence and Electronic Signature Law Review, the electronic system aims to "increase the efficiency and transparency of land registration and management of land records in line with modernization and the orientation of developing economic ecosystems towards the

industrial revolution 4.0" (Tediosaputro & Sukarningsih, 2023). This digitalization is projected to reduce bureaucracy and streamline the certification process.

2. **Reduction in Land Disputes and Fraud**
   One of the key objectives of the electronic land certification program is to minimize land disputes and fraudulent activities. The Social Expat reports that this innovation aims to curb land mafia activities in Indonesia, with an anticipated reduction of 90% over the coming years(Tediosaputro & Sukarningsih, 2023). By providing a secure and transparent digital record, the system is expected to significantly reduce issues like duplicate certificates and unauthorized changes to land ownership records(Djaja & Wiryana, 2023; Noor, 2021).
3. **Improved Economic Prospects**
   The transition to electronic land certificates is expected to have positive economic implications. A study published in the FIG Working Week 2023 proceedings notes that the digital transformation in land services is targeted to increase revenue for the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN)(Irfan et al., 2023). Furthermore, by streamlining property transactions, this system could potentially improve Indonesia's 'Ease of Doing Business' rating, attracting more foreign investment in the real estate sector.
4. **Gradual Implementation and Expansion**
   The implementation of electronic land certificates is being carried out in phases. As of 2023, 13 regencies/cities have been declared 'complete' as priorities for fully implementing electronic land certificates(Adinegoro & Swahyuni, 2024). The government aims to expand this system nationwide, with a target of having all 126 million land plots in Indonesia mapped and certificates issued by 2025(Rizka, 2023; Setkab, 2023).
5. **Technological Advancements and Security Measures**
   Future prospects include further technological advancements to enhance the security and functionality of the electronic certification system. The use of blockchain technology, similar to approaches adopted in countries like Sweden and the UK, could be a future consideration to further secure land registry transactions(Yuliawan, 2022).

III. CONCLUSION

Accelerating digitalization in land administration in Indonesia through the implementation of electronic land certificates is a strategic step aimed at simplifying applications and platforms and accelerating the implementation of the electronic-based government System (SPBE). These efforts are also integrated into the National Portal, creating a more efficient and connected system.

Digital transformation in land administration in Indonesia through the Complete Systematic Land Registration (PTSL) program and the implementation of electronic land certification shows the government's commitment to improving efficiency, transparency and quality of public services. The direction of the President of the Republic of Indonesia, which focuses on simplifying applications and platforms, accelerating the implementation of the Electronic Based Government System (SPBE), and integrating land services into the National Portal, has become the main pillar in this modernization. The PTSL program,

which maps 126 million plots of land in Indonesia, creates a comprehensive land database, facilitating faster, more accurate, and safer implementation of electronic certification. This transformation is expected to be able to overcome various challenges that exist in land management, such as the high volume of services that is disproportionate to the amount of human resources available, as well as the problem of damage and loss of physical records due to natural disasters or the unkempt condition of land offices.

By modernizing electronic land services, Indonesia can learn from the experiences of countries such as Macedonia, the Kyrgyz Republic, Finland and Poland, which have succeeded in improving their land data services and maintenance efficiency. Implementing electronic land certificates also aims to increase data security and validity, reduce the risk of loss or damage, and ensure the accuracy and speed of land information services. Digital technology in issuing land certificates saves physical archive storage space, speeds up the product issuance process, and reduces the number of signatures required. In addition, by integrating data and information between institutions through various strategic initiatives, the land management process becomes more transparent and accountable, supporting the realization of better and more reliable public services.

This entire initiative is driven by the President's instructions and firm government policy to implement electronic certificates on a massive scale. With strong regulatory support and commitment from all relevant parties, digital transformation in land administration in Indonesia is expected to bring significant positive changes, answer current challenges, and prepare a more resilient land system for the future.

The future prospects of the electronic land certification program in Indonesia are largely positive with potential for significant improvements in efficiency, transparency, and security of land management. However, its success will depend on addressing current challenges, particularly in terms of infrastructure, digital literacy, and public awareness. The gradual implementation approach adopted by the government allows for continuous learning and improvement, which bodes well for the long-term success of the electronic land certification program.

IV. REFERENCES

Adinegoro, R. K. R., & Swahyuni, D. (2024). Challenges in Implementing Land Certificates at the Ministry of Agrarian Affairs and Spatial Planning. *Marcapada: Jurnal Kebijakan Pertanahan*, *1*(3), 71–80. https://jurnalmarcapada.stpn.ac.id/index.php/JM/article/download/42/75/514

Aksenta, A., Irmawati, I., Ridwan, A., Hayati, N., Sepriano, S., Herlinah, H., Silalah, A. T., Pipin, S. J., Abdurrohim, I., & Boari, Y. (2023). *Literasi Digital: Pengetahuan & Transformasi Terkini Teknologi Digital Era Industri 4.0 dan Sociaty 5.0*. PT. Sonpedia Publishing Indonesia.

Al Fawwaz, H. A. (2019). *Implementasi sistem online single submission dalam pelayanan izin mendirikan usaha secara elektronik di Dinas Penanaman Modal dan Pelayanan Terpadu Satu Pintu Kabupaten Ngawi: Perspektif Peraturan Pemerintah nomor 24 tahun 2018 dan hukum Islam*. Universitas Islam Negeri Maulana Malik Ibrahim.

AM, M. (2019). *PTSL, Pendaftaran Tanah Sistematis Lengkap & Dasar Hukumnya*.

AS, Y. S. M., & SH, M. H. (2024). *E-GOVERNMENT DALAM PELAYANAN PUBLIK*. CV. AZKA PUSTAKA.

Awaludin, L. (2019). Strategi penguatan kompetensi SDM Teknologi Informasi&Komunikasi (TIK) dalam mengoptimalkan penerapan Sistem Pemerintahan Berbasis Elektronik (SPBE). *Paradigma POLISTAAT: Jurnal Ilmu Sosial Dan Ilmu Politik*, *2*(2), 118–134.

Azizah, N. (2023). *OPTIMALISASI PROGRAM PENDAFTARAN TANAH SISTEMATIS LENGKAP (PTSL) DALAM PELAYANAN ADMINISTRASI PADA KANTOR PERTANAHAN KABUPATEN JEPARA*. Universitas Islam Sultan Agung.

DAN, M. K. H. (n.d.). *PROGRAM STUDI ILMU HUKUM PASCASARJANA UNIVERSITAS BOSOWA MAKASSAR*.

Djaja, B., & Wiryana, L. H. (2023). Electronic Certificate in the Digitalization of Land Management in Indonesia: an Application of Theory “for What Is Inexistent – a New One Is Procured.” *International Journal of Application on Social Science and Humanities*, *1*(1), 99–107. https://doi.org/10.24912/ijassh.v1i1.25695

Erfa, R. (2020). Digitalisasi Administrasi Pertanahan Untuk Mewujudkan Percepatan Pembangunan Nasional Perspektif Kebijakan Hukum (Legal Policy). *Jurnal Pertanahan*, *10*(1).

Fonna, N. (2019). *Pengembangan revolusi industri 4.0 dalam berbagai bidang*. Guepedia.

Hadi, N. I. (2022). *Kepastian Hukum Sertipikat Hak Atas Tanah Elektronik Dalam Hukum Pertanahan di Indonesia*. Universitas Islam Sultan Agung (Indonesia).

Hapsari, W., Sanusi, S., & Nuridin, N. (2022). *Legal Protection for Land Ownership Certificate Holders in Positive Indonesian Law*. https://doi.org/10.4108/eai.28-5-2022.2320549

Hardjaloka, L. (2014). Studi penerapan e-government di indonesia dan negara lainnya sebagai solusi pemberantasan korupsi di sektor publik. *Jurnal Rechts Vinding: Media Pembinaan Hukum Nasional*, *3*(3), 435–452.

Hidayah, E. S., & Almadani, M. (2022). Analisis Tingkat Kematangan Sistem Pemerintahan Berbasis Elektronik (SPBE) pada Pemerintah Provinsi Sulawesi Selatan. *Jurnal Teknologi Dan Komunikasi Pemerintahan*, *4*(2), 49–67.

Ibrahim, M. A., & Triadi, I. (2024). Dinamika Hukum Pertahanan Dan Keamanan Negara Dalam Konteks Globalisasi: Tantangan Dan Prospek Di Abad Ke-21. *Hakim*, *2*(1),

110–117.
Indonesia, R. (2020). Rencana pembangunan jangka menengah nasional 2020-2024. *Peraturan Presiden Republik Indonesia*, *303*.
Investment, F. A. O., & Investment, C. (2022). Funding digital transformation of land administration. *Funding Digital Transformation of Land Administration*. https://doi.org/10.4060/cc1880en
Irfan, M., Parasu, I. Y. I., & Sucaya, K. A. (2023). Digital Transformation in Indonesia Land Services. *Proceeding FIG Working Week 2023 Protecting Our World Conquering New Frontiers*, *June 2023*. https://www.fig.net/resources/proceedings/fig_proceedings/fig2023/papers/ts08j/TS08J_irfan_yunindra_ibnu_parasu_12062_abs.pdf
Krismantoro, D. (2023). The Urgency of Electronic Land Certificates in the Land Registration Legal System in Indonesia. *Journal of Law and Sustainable Development*, *11*(10), e1808. https://doi.org/10.55908/sdgs.v11i10.1808
Kusmayadi, E., & Hum, M. (2015). Dasar-dasar Teknologi Informasi dan Komunikasi. *Universitas Terbuka*, 1–10.
Kusmiarto, K., Aditya, T., Djurdjani, D., & Subaryono, S. (2021). Digital Transformation of Land Services in Indonesia: A Readiness Assessment. In *Land* (Vol. 10, Issue 2). https://doi.org/10.3390/land10020120
Lina, A. (2023). *Perbandingan Hukum Badan Bank Tanah Di Indonesia Dan Amerika Serikat*. Universitas Islam Malang.
Long, H., Zhang, Y., Ma, L., & Tu, S. (2021). Land Use Transitions: Progress, Challenges and Prospects. In *Land* (Vol. 10, Issue 9). https://doi.org/10.3390/land10090903
Masdar, S., Asmorowati, S., & Irianto, J. (2009). *Manajemen sumber daya manusia berbasis kompetensi untuk pelayanan publik*. Airlangga University Press.
Musadad, A., & Marbun, M. T. (2024). KENDALA PELAYANAN HAK TANGGUNGAN TERINTEGRASI SECARA ELEKTRONIK BERDASARKAN PERATURAN MENTERI AGRARIA NOMOR 5 TAHUN 2020:(Studi Kasus pada Kantor Notaris/PPAT MERI EFDA, SH dan PT Bank Rakyat Indonesia (Persero) Tbk, Kantor Cabang Jakarta Panglima Polim). *Causa: Jurnal Hukum Dan Kewarganegaraan*, *2*(11), 38–58.
Nainggolan, H., Nuraini, R., Sepriano, S., Aryasa, I. W. T., Meilin, A., Adhicandra, I., Putri, E., Andiyan, A., & Prayitno, H. (2023). *GREEN TECHNOLOGY INNOVATION: Transformasi Teknologi Ramah Lingkungan berbagai Sektor*. PT. Sonpedia Publishing Indonesia.
Negara, C. U. K. K., Pratiwi, N. W. W., & Maylinda, P. D. (2021). Urgensi sistem pengamanan pada sertifikat tanah digital. *Jurnal Hukum Lex Generalis*, *2*(9), 832–855.
Noor, A. (2021). Legal Status of Electronic Land Certificate in the Land Case Proof System in Indonesia. *International Journal of Cyber Criminology*, *15*(1), 18–43. https://doi.org/10.5281/zenodo.4766541
Permadi, I. (2023). Electronic title certificate as legal evidence: The land registration system and the quest for legal certainty in Indonesia. *Digital Evidence and Electronic Signature Law Review, 20, 47-61*.
Permana, B. A., Halim, A., & Uraidi, A. (2024). KEKUATAN HUKUM PEMBUKTIAN SERTIFIKAT ELEKTRONIK DALAM PERKARA PERDATA MENURUT PERATURAN MENTRI ATR/KEPALA BPN NO 3 TAHUN 2023 TENTANG PENERBITAN SERTIFIKAT ELEKTRONIK DALAM KEGIATAN

PENDAFTARAN TANAH. *Jurnal Ilmiah AKSES*, *2*(1), 61–75.

Prasetya, A. G. N. (2022). *Analisis Yuridis Terhadap Penggunaan Tanda Tangan Elektronik pada Sertipikat Tanah Elektronik Dalam Konsepsi Kepastian Hukum*. Universitas Islam Sultan Agung (Indonesia).

Rahayu, W. I. (2020). *PROSEDUR PEMBAYARAN DAN PELAPORAN PAJAK PENGHASILAN (PPh) PASAL 4 AYAT (2) FINAL ATAS PENGALIHAN HARTA TANAH DAN/ATAU BANGUNAN DI KANTOR PELAYANAN PAJAK (KPP) PRATAMA SUKABUMI*. Universitas Muhammadiyah Sukabumi.

Rejekiningsih, T. (2016). Asas fungsi sosial hak atas tanah pada negara hukum (suatu tinjauan dari teori, yuridis dan penerapannya di indonesia). *Yustisia*, *5*(2), 298–325.

Rifai, Y. A., Rahmi, Y. A., & Aprilia, V. (2022). Digitalisasi Arsip Pertanahan Pada Badan Pertanahan Nasional Kota Bandung. *JIA: Jurnal Ilmiah Administrasi*, *10*(2), 81–87.

Rizka, A. (2023). *Indonesian Government Officially Launch the Electronic Land Certificate*. Social Expat. https://www.socialexpat.net/indonesian-government-officially-launch-the-electronic-land-certificate/

Salma. (2021). *Electronic Certificate to Ease Land Registration in Indonesia*.

Setkab. (2023). *President Jokowi Launches E-Land Certificate*. Setkab News. https://setkab.go.id/en/president-jokowi-launches-e-land-certificate/

Silviana, A. (2021). Urgensi sertipikat tanah elektronik dalam sistem hukum pendaftaran tanah di Indonesia. *Administrative Law and Governance Journal*, *4*(1), 51–68.

Susilo, R. A. T. & Y. S. (2023). Conditions, Challenges and Prospects of State-owned Enterprises in Indonesia: The Governance Perspective Based on Economic Constitution. *SpringerLink*.

Sutirman, S. P. (2020). *Administrasi Kearsipan di Era Teknologi Informasi*. UNY Press.

Tediosaputro, L., & Sukarningsih, R. M. (2023). Electronic Land Certificate Versus Analog Land Certificate in Proof of Ownership Certainty. *Proceeding ICLEH 2022*, 150–157. https://doi.org/10.2991/978-2-38476-024-4_18

Yudhoyono, H. A. H. (2024). *Percepatan Digitalisasi Untuk Indonesia Terintegrasi*.

Yuliawan, I. (2022). Electronic Land Certificates in the Perspective IUS Constitutum and IUS Constituum in Semarang Regency. *The Virtual International Conference on Economics, Law and Humanities*, *1*(1), 119–129. https://callforpaper.unw.ac.id/index.php/ICOELH/article/view/159