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LEGAL LANDSCAPE OF BLOCKCHAIN TECHNOLOGY AND LAND REGISTRATION IN INDONESIA

Evan Tjoa Putra dan Lewiandy

Fakultas Hukum Universitas Tarumanagara

Author's Correspondence : lewiandy@fh.untar.ac.id

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ABSTRAK

Teknologi blockchain menawarkan potensi signifikan untuk mengatasi ketidakefisienan dan kerentanan dalam sistem pendaftaran tanah di Indonesia. Penelitian ini mengeksplorasi integrasi blockchain dalam pendaftaran tanah melalui analisis hukum, dengan mengkaji kerangka hukum saat ini dan mengidentifikasi tantangan utama seperti privasi data, keberlakuan kontrak pintar, dan tanggung jawab dalam sistem terdesentralisasi. Penelitian ini menyoroti perlunya reformasi hukum dan menyelaraskannya dengan peraturan teknologi informasi seperti UU ITE dan UU Penyelenggaraan Sistem Elektronik. Namun, implementasi yang berhasil memerlukan kerangka regulasi yang menangani kompleksitas teknologi blockchain sambil memastikan kepastian hukum dan perlindungan bagi semua pemangku kepentingan. Dengan mereformasi sistem hukum untuk mengakomodasi blockchain, Indonesia dapat memodernisasi proses pendaftaran tanahnya, mengurangi penipuan, dan meningkatkan kepercayaan publik terhadap catatan tanah.

Kata Kunci: Teknologi Blockchain, Pendaftaran Tanah, UU ITE

ABSTRACT

Blockchain technology provides exceptional potential for the elimination of the inefficiencies and vulnerabilities in the land registry system in Indonesia. This paper therefore examines the incorporation of blockchain in land registration by use of a legal analysis, while studying the current framework and pointing out key challenges such as data privacy, reliabilities of smart contract enforcement, and liability in decentralized systems. It underlines the need for legal reforms in the amendment of existing land laws and harmonization with information technology regulations such as the ITE Law and the Law on the Operation of Electronic Systems. However, effective implementation enforces regulatory frameworks that respond to the various complexities introduced by blockchain technology in an efficient manner, at the same time offering legal certainty and protection to all the parties involved. Indonesia can modernize the part of its processes related to land registration by applying blockchain, which at some point could reduce fraud and increase public trust in the land records system.

Keywords: Blockchain Technology, Land Registration, UU ITE

A. INTRODUCTION

Blockchain technology has enormous potential to change the way many industries function today—with decentralization, immutability, and enhanced security.[1] It has made an enormous impact on financial services, supply chain management, and public administration, among many other areas. One of the newest applications of blockchain is in land registration, where it can contribute to process efficiency and transparency while bringing down cases of fraud.[2] Against the Indonesian backdrop, characterized by ineffective land registration, opacity, and high levels of litigation over land ownership as persistent challenges to the rule of law,[3] blockchains offer an effective transformative opportunity.[4] The current land registration system of Indonesia is governed by legislation, primarily by Law Number 5 of 1960 concerning Basic Agrarian Law and Number 18 of 2021 concerning Management Concession, Land Title, Strata Title, and Land Registry in lieu of Law Number 24 of 1997 concerning Land Registration.

These statutes detail the methodology of recording rights on land, issuance of testimonies, and legal certainty over ownership of land. Despite these legal instruments, the land registration system in Indonesia is undermined by inefficiency, long-winding processes, overlapping claims, and fraudulent transactions.[5] Besides, these challenges to the system point out an imperative for modernization, and in this manner, blockchain technology has been perceived as a potential solution. Blockchain has huge potential to greatly improve land registration in Indonesia through an immutable, transparent digital ledger. Lack of reliable and tamper-proof records in the existing system is what causes conflicts

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[1]Et Al. Salwa Shakir Mahmood, "Enhancing Network Security Through Blockchain Technology: Challenges and Opportunities," *International Journal on Recent and Innovation Trends in Computing and Communication* 11, no. 10 (November 2, 2023): 1670–77, https://doi.org/10.17762/ijritcc.v11i10.8729.

[2]Ayesha Riaz, Muhammad Jawad Ikram, and Najmussaba Asadullah, "Using Blockchain to Overcome the Issues in Land Registry Management: A Systematic Review," January 23, 2023, https://doi.org/10.1109/icaisc56366.2023.10085673.

[3]Okto Berlin Gultom et al., "Legal Certainty in the Land Registration Process Originating from Inheritance," January 1, 2020, https://doi.org/10.2991/assehr.k.200306.200.

[4]Don Tapscott and Alex Tapscott, *Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World*, 2016, https://openlibrary.org/books/OL27212411M/Blockchain_revolution. p. 204

[5]Gultom et al., "Legal Certainty in the Land Registration Process Originating from Inheritance."

related to land ownership.[6] It can, therefore, provide a secure platform for recording and verifying transactions related to land ownership—ensuring that parties are operating with the exact same verifiable set of information.

The potential outcome would be a considerable reduction in both time and cost associated with land registration, thus benefiting the government and landowners alike. At the global level, countries such as Sweden and Georgia piloted blockchain-based land registration systems and tested their feasibility.[7] In Sweden, the government digitized land records with blockchain technology, bringing more transparency to the procedure that involved less fraud. On its part, Georgia introduced a blockchain-based land registry in a bid to increase transparency and forestall tampering with land records.[8] These examples are useful demonstrations of effectively integrating blockchain into existing land registration systems and bring valuable lessons to Indonesia.

The application of blockchain technology to Indonesia's land registration would, however, have to duly consider the existing legal framework. The Land Registration Laws in Indonesia were not drafted with blockchain technology in view, so certain legal reforms might be required to accommodate this new technology in order to guarantee that blockchain-based land records are admissible as legally valid. Besides the land registration laws, the implementation of blockchain would also be bound by the information technology laws. In Indonesia, Law Number 11 of 2008 concerning Electronic Information and Transactions governs the use of electronic systems and transactions.

This law, in relation to its amendments in Law Number 19 of 2016 concerning Electronic Information and Transaction in lieu of Law Number 11 of 2008 concerning Electronic Information and Transaction Law, is the legal basis for

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[6]Vinay Thakur et al., "Land records on Blockchain for implementation of Land Titling in India," *International Journal of Information Management* 52 (June 1, 2020): 101940, https://doi.org/10.1016/j.ijinfomgt.2019.04.013.

[7]Vishnu Shukla et al., "BLOCKCHAIN IN LAND REGISTRY FOR TRANSFORMING LAND ADMINISTRATION," *Journal of Theoretical and Applied Information Technology* 102, no. 3 (February 15, 2024): 1014–22, https://www.jatit.org/volumes/Vol102No3/19Vol102No3.pdf. p. 1016

[8]Qiuyun Shang and Allison Price, "A Blockchain-Based Land Titling Project in the Republic of Georgia: Rebuilding Public Trust and Lessons for Future Pilot Projects," *Innovations Technology Governance Globalization* 12, no. 3–4 (January 1, 2019): 72–78, https://doi.org/10.1162/inov_a_00276.

supporting electronic documents and transactions as valid evidence in court.[9] By logical implication, therefore, the blockchain-based land records would fall under the purview of the ITE Law as an electronic document, with its legal validity and enforceability assured. Moreover, the ITE Law dictates that an operator of any electronic system, though not explicitly, but this also includes blockchain operators, shall be responsible for ensuring reliability, security, and integrity in their respective systems.[10] Therefore, this law underlines much the protection of electronic information, which should be free from any tampering or other unauthorized access, which is very central to the integrity of blockchain land title records. Besides, the government is also given the mandate to oversee the application and has assurance that electronic systems will be carried out based on legitimate regulations, even monitoring and exercised in the application of blockchain in land registration.[11]

The potential that blockchain holds with respect to land registry in Indonesia is huge, but it would depend on how far the legal framework is ready to accommodate the technology. Legal reforms would almost certainly be needed to give effect to blockchain-based land records as being valid and enforceable and to render the use of a blockchain in conformity with existing information technology laws. Overcoming these legal challenges can enable Indonesia to unlock the potential for blockchain to push forward innovation in its land registration system toward efficiency, transparency, and trust.

This paper focuses on the legal perspectives relating to the application of blockchain technology for land registration in Indonesia. This research will go into detail about the status quo of land registration's legal framework, analyze potentials for benefits and challenges to merge blockchain, and set forward some legal reforms on the way to developing this technology for legal certainty, transparency, and protection for all parties connected with these transactions. We will discuss the relevant Indonesian laws, especially those related to land laws, and learn some

[9]See Article 5(1) of Law Number 11 of 2008 concerning Electronic Information and Transaction.

[10]See Article 15 of Law Number 11 of 2008 concerning Electronic Information and Transaction.

[11]See article 40 of Law Number 11 of 2008 concerning Electronic Information and Transaction.

information about technology regulations from related international case studies. Based on this, we formulated two research questions:

1. How can Indonesia's existing legal framework for land registration be adapted to accommodate the implementation of blockchain technology, and what legal reforms are necessary to ensure the validity and enforceability of blockchain-based land records?
2. What are the legal challenges of integrating blockchain technology in Indonesia's land registration system, particularly in relation to compliance with information technology laws such as the ITE Law and the Operation of Electronic Systems Law?

B. DISCUSSION

1. Existing Legal Framework for Land Registration in Indonesia

The Indonesian land registration system is primarily based on Law Number 5 of 1960, known as the Basic Agrarian Law, which sets out the basic principles of land regulation in Indonesia by identifying the steps to obtain, transfer, and register land rights toward the objective of legal certainty and protection to the legal owners of the land. The Agrarian Law stresses registration in order to bring clarity to land ownership and protect against disputes. From the same law, it requires the government to undertake a land registration system through measurement, mapping, and registration of land and the issuance of a certificate thereof as proof of ownership.[12]

Also in addition to the Basic Agrarian Law, Government Regulation Number 24 of 1997 concerning Land Registration elaborates more on land registration. The technical aspects of land measurements and maps, as well as the issuance of land certificates, are explained by the regulation, which also contains the roles of the National Land's Agency, or *Badan Pertanahan Nasional* (BPN), in heading the implementation of the land registration process and in making sure that the rights over land are properly recorded.[13] It is also to facilitate the relative process of

[12]See Article 19 of Law Number 5 of 1960 concerning Basic Agrarian Law.

[13]See Article 5(1) of Government Regulation Number 24 of 1997 concerning Land Registration.

registration of ownership rights over land and land restructuring in such a manner that would be followed by fewer land disputes. This notwithstanding, the legal regime is *'silent'* on the application of emerging technologies such as blockchain in accomplishing efficiency and transparency related to land registration.

One of the biggest legal voids under the current framework is the lack of provisions regarding the recognition and validation of blockchain-based records as a legally binding source of evidence. The existing laws, on the other hand, require the registry of land rights to be registered within a formal proceeding with the competent office, which is the BPN,[14] and a physical document to be possessed as proof of ownership.[15] However, blockchain is a digital ledger, which is the very final and unarguable record of transactions without the need for physical documentation.

In the event that blockchain records do not support formal government records, this could open up enforcement issues against landowners, given the lack of legal recognition of digital records. Although Government Regulation Number 18 of 2021 concerning Management Concession, Land Title, Strata Title, and Land Registry emphasizes the existence of electronic land registration,[16] however, there is another large loophole in the current legislation: neither the act nor government regulation talk of the formation of contracts with the use of smart contracts for land deals. Of course, smart contracts could automate landing transactions in many aspects, like the transfer of ownership at the receipt of payment, but still, their enforcement power under Indonesian law is sort of moot. Neither the Basic Agrarian Law nor the Government Regulation on Land Registration explicitly mention smart contracts; hence, it remains in interim-anonymous legal limbo with regard to a land transaction using blockchain technology. This is followed by the fact that the current legal framework is weak in addressing the issues of data privacy and security concerns associated with blockchain. With blockchain's nature of

[14]*Ibid*.

[15]See Article 1 Number 9 of Government Regulation Number 18 of 2021 concerning Management Concession, Land Title, Strata Title, and Land Registry in lieu of Law Number 24 of 1997 concerning Land Registration. Also see Article 19(2)(c) of Law Number 5 of 1960 concerning Basic Agrarian Law.

[16]See Article 84 of Government Regulation Government Regulation Number 18 of 2021 concerning Management Concession, Land Title, Strata Title, and Land Registry in lieu of Law Number 24 of 1997 concerning Land Registration.

decentralization, it simply means that every land transaction record is spread over a ledger maintained in all network nodes, and this raises concerns about the protection of personal data—how secure is personal data in blockchain channels?

In 2022, the Indonesian government will have advanced law governing the protection of data. Law Number 3 Year 2022 on Personal Data Protection (PDP), this law was enacted before blockchain-based land registration emerged, and so is likely to require amendment to ensure they are adopted in a blockchain-based land registration system. There is the potential issue of liability in case any mistakes or fraud arise relating to blockchain-based land transactions. Supposedly, the legal responsibility for accurate land records and dispute resolution lies with the BPN; hence, a blockchain-based land certificate must be issued by the governmental bodies.

This is another huge gap in the law that needs closing to make things right and engage blockchain-based land registration systems. Overall, Indonesia's current legal system of land registration creates first steps in allowing for the provision of legal certainty and protection of rights, but it cannot yet deal with the complications of adopting blockchain technology. Legally, it is required that there be some reform in certain laws to provide for the recognition of blockchain records and the use of smart contracts taking place under data privacy and liability, where necessary, to ensure their execution.

2. The Applicability of Blockchain Technology in Land Registration

Blockchain technology is fully poised to revolutionize land registration—it seeks to terminate some of the inefficiencies and vulnerabilities present in the traditional system. Decentralized, immutable, and transparent main features make blockchain technology best suited for securely recording and verifying all the transactions that are related to the sale of land.[17] Within any blockchain-based land registration system, each transaction would be recorded on a distributed ledger copy accessible to each participant of the network and irrevocably prove that all records are consistent.

[17]Aidil Rezjki Suljztan Syawaludin and Rinaldi Munir, "Registration of Land and Building Certificate Ownership using Blockchain Technology," August 2, 2021, https://doi.org/10.1109/iciss53185.2021.9533191.

Central to one of the main arguments for the use of blockchain technology is its decentralization. For the most part, traditional mechanisms for recording land ownership are done by a government institution at the national level, for example, the National Land Agency in Indonesia. This, however, harbors some vulnerabilities in a centralized system, whereby a single point of failure may cause data loss or tampering.[18] On the other hand, blockchain scatters data among nodes, making it impossible for a single organization to tamper with its records without the consensus of the network. Such a decentralized structure using the four-node interplanetary file system (IPFS) brings about greater security and reliability in land registration records by reducing the risk related to fraud and corruption.[19]

Another core characteristic of blockchain technology is its immutability, meaning that once information has been recorded on the blockchain, there cannot be any alteration or deletion.[20] One area where this is specifically important is in land registration; making fraudulent changes in records can turn the record into a genesis for disagreement and thus a litigation problem. Blockchain technology, through the indelible records of land transactions, can facilitate protection against fraud with immutable land transaction records that would maintain accuracy and keep the records trustworthy over time.

This traceability function provides a transparent audit trail, whereby everybody can verify the history of a property and its ownership.[21] Another significant advantage of using blockchain technology in land registration is transparency. In many traditional systems of land registration, the records can only be accessed by particular government officials or parties—authorized individuals—

[18]None Tony Haryanto, Kalamullah Ramli, and Arga Dhahana Pramudianto, "DATA AVAILABILITY IN DECENTRALIZED DATA STORAGE USING FOUR-NODE INTERPLANETARY FILE SYSTEM," *Jurnal Teknik Informatika (Jutif)* 4, no. 3 (June 26, 2023): 639–45, https://doi.org/10.52436/1.jutif.2023.4.3.1030.

[19]*Ibid*.

[20]Mykyta Savchenko, Vitaliy Tsyganok, and Oleh Andriichuk, "Decision Support Systems' Security Model Based on Decentralized Data Platforms," January 1, 2018, https://procon.bg/article/decision-support-systems-security-model-based-decentralized-data-platforms.

[21]Justin Sunny, Naveen Undralla, and V. Madhusudanan Pillai, "Supply chain transparency through blockchain-based traceability: An overview with demonstration," *Computers & Industrial Engineering* 150 (December 1, 2020): 106895, https://doi.org/10.1016/j.cie.2020.106895.

thereby giving room for manipulative situations and corruption. On the other hand, in blockchain, more transparency is enabled because all transactions are placed on a public ledger, making them accessible to anyone who has such permission. Such transparency will instill trust in the land registration system, as all parties involved in a transaction can independently verify the information recorded on the blockchain.

Globally, there are examples of such systems from which Indonesia can draw valuable lessons, as countries have already experimented with blockchain-based land registration systems. And as a case in point, the Swedish government has initiated pilot use of blockchain technology in the digitization of land records and the improvement of the effectiveness of land transactions. With land records moving on to a blockchain, Sweden aims at bringing about a reduction in time and thereby the cost of transactions concerning property, which is of great public significance, simultaneously increasing transparency and bringing down the risk of fraud.[22] The project reaped a bit of success as the participants reported that transactions happened quicker and more securely than under the traditional system.

This, in effect, would accrue benefits to landowners as well as the government, which is in a position to reduce administrative burdens in general and enhance efficiency in land registration. Some of the factors necessary for the successful introduction of blockchain in land registration in Indonesia are the availability of a developed, supportive legal infrastructure and the availability of the necessary, required technological infrastructure. As discussed above, the current existing legal framework in place does not recognize land records based on blockchain technology, which now forms a huge barrier to its liberality. Additionally, government investment would be necessary for the technological infrastructure through which a blockchain-based land registration system should be able, guaranteed, and secured, such as the provision of reliable internet access throughout the whole country.

[22]Shukla et al., "BLOCKCHAIN IN LAND REGISTRY FOR TRANSFORMING LAND ADMINISTRATION."

3. Relevant Information Technology Laws and Blockchain Technology

Blockchain is essentially a method for electronic transactions in using electronic systems to manage and secure information. In this understanding, the application of blockchain in the registration of land in Indonesia will have to abide by the current information technology legislation, relevant to the regulation and conduct of electronic systems and transactions. Such laws are necessary to provide a legal basis for the recognition and validation of electronic records and associated transactions with any land registration records done through blockchain.

One of the main key regulations on electronic transactions happened to be Law Number 11 of 2008 concerning Electronic Information and Transaction (ITE Law). This act regulates systems electronically through the reliability and safety of electronic transactions. Given that the ITE Law itself provides standards that any blockchain-based land registration system must meet, this law is particularly relevant to blockchain technology. The ITE Law stipulates that operators of electronic systems must ensure systems, reliability, and security, respectively.[23] Additionally, the ITE Law specifies among minimum conditions the need for protection of availability, integrity, authenticity, confidentiality, as well as accessibility of information in electronic systems.[24] These requirements are essential to maintaining the security and reliability of land registration in systems using blockchain.

Furthermore, electronic transactions evidenced in electronic contracts are binding upon the parties involved.[25] All this makes an open-ended interpretation where the technology of the blockchain through which smart contracts can be implemented would allow for automation of land transactions protocol. Having such electronic contracts established as legally enforceable under the ITE Law takes care of legal requirements for having such type of agreements during blockchain land transactions through smart contracts, as these contracts are enforceable in the exact same way as traditional contracts.

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[23]See Article 15 of Law Number 11 of 2008 concerning Electronic Information and Transaction.

[24]See Article 16 of Law Number 11 of 2008 concerning Electronic Information and Transaction.

[25]See Article 18 of Law Number 11 of 2008 concerning Electronic Information and Transaction.

The ITE Law was further revised by Law Number 19 Year 2016, which emphasized the legal standing of electronic information and documents as evidence in court. Electronic information and electronic documents can be used as legal evidence as long as they fulfill some conditions.[26] This is crucial for blockchain land registration in ensuring that the records stored on the blockchain are admissible in evidence at times of legal clashes. In addition, the amended law clearly emphasizes the protection of electronic systems by the government from misuse and ensures that their operation is secure.[27] It illustrates government oversight in implementing blockchain technology for land registration, which ensures that land registration is not only sure but also done in a manner within the law.

Another relevant piece of regulation is the second amendment of the law in question. Law Number 1 of 2024 concerning the Second Amendment of Electronic Information and Transaction. This law provides for the regulation of the electronic system operators in a manner pursuant to the purposes of ensuring that such systems are reliable, secure, and capable of protecting electronic messages from alteration and unauthorized access. Article 13 specifically requires operators of electronic certification to ensure that the creation of electronic signatures is related to its owner,[28] relevant to ensuring the validity of the recorded transactions on a blockchain. In addition, the law provides that the government must make the digital ecosystem fair, accountable, safe, and secure to help enhance innovation, which means that it is within their mandate to monitor and control the use of the blockchain in land registration.[29] This framework ensures that the use of blockchain technology in public administration takes place in a secure and responsible manner, with due oversight and regulation.

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[26]See Explanation of Article 5 of Law Number 19 of 2016 concerning Electronic Information and Transaction in lieu of Law Number 11 of 2008 concerning Electronic Information and Transaction.

[27]See Article 40 of Law Number 19 of 2016 concerning Electronic Information and Transaction in lieu of Law Number 11 of 2008 concerning Electronic Information and Transaction.

[28]See Article 13 of Law Number 1 of 2024 concerning the Second Amendment of Electronic Information and Transaction in lieu of Law Number 19 of 2016 concerning Electronic Information and Transaction in lieu of Law Number 11 of 2008 concerning Electronic Information and Transaction.

[29]See Article 40A of Law Number 1 of 2024 concerning the Second Amendment of Electronic Information and Transaction in lieu of Law Number 19 of 2016 concerning Electronic Information and Transaction in lieu of Law Number 11 of 2008 concerning Electronic Information and Transaction.

Harmonizing these laws, however, could turn out to be a challenge, as the laws on information technology need to be synchronized with Indonesia's existing land registration guidelines. The Basic Agrarian Law and Government Regulation on Land Registration were not designed with blockchain technology in mind, and they provide for physical documentation and formal requirements for land rights registration. The introduction of blockchain under this regime would also require legal reform that recognizes issues related to matters of digital records to be as good as those of physical documents. This could be achieved through amendments to the Basic Agrarian Law and to other basic land-related laws to explicitly allow for blockchain-based land records and smart contracts.

Additionally, harmonizing information technology laws with land laws will require the development of new regulations focusing especially on the challenges resulting from the advent of blockchain technology. Most of such regulations would have to touch on data privacy, security, and liability with respect to decentralized systems. Furthermore, the decentralized nature of blockchain raises questions as to who will be held liable in the event of errors or fraud within the system. At present, it is the duty of the National Land Agency's to ensure the correctness of land records, but in a blockchain system, liability is likely not going to fall under those currently assumed by a centralized ledger.

New regulations are indeed required to clarify such issues so that all parties involved are protected by the law for blockchain-based land transactions. In other words, the successful implementation of blockchain technology in the land registration system of Indonesia will indeed need consideration of the various existing laws that apply in the information technology landscape, such as the ITE Law and the Operation of Electronic Systems Law. These laws thus provide the legal basis for the system and for the transaction made through that system; however, the harmonization of these laws with the land registration regulations should be maintained to ensure further recognition and enforceability of the blockchain-based records. Legal amendments might need to be made to account for the unique challenges presented by the technology in order to give Indonesia full benefit from this innovative approach to land registration.

4. Legal Challenges, Opportunities, and Recommendation for Policy Makers

Realizing these benefits through the modernization that blockchain technology implies in the Indonesian land registry system raises implementation issues that should be responded to in line with the already-fused legal regime. Issues to address include security and privacy of data, legal enforceability of smart contracts, and burdening land transaction liability in a blockchain. Meanwhile, these challenges create opportunities for legal reform, which would make Indonesia's legal system stronger and more accommodating to the technologies of next generations.

Any blockchain-based system for land registration brings to light concerns of data privacy and data security at the pinnacle. This would mean that land transaction records, being replicated and distributed on many nodes, become virtually impossible for any single entity to tamper with. This equally raises questions, however, about how personal data can be protected. Indonesian law, in particular, Law Number 3 Year 2022 concerning Data Protection, does give some ways to protect personal data but might not be adequate to entirely meet the unique challenges blockchain technology brings to the scene.

For example, blockchain immutability may conflict with the right to data erasure in a manner whereby information recorded in blockchain data should be easily altered or deleted. Legal reforms need to occur so that blockchain-based land registration systems become more compliant with data protection requirements, yet can still deliver these very solutions with the current integrity and transparency that make blockchain valuable in the first place.[30] Enforceability is another legal challenge for smart contracts that deal with self-executing intentions, wherein the terms of the agreement are directly written in code.[31] For instance, a blockchain-based land registration would use smart contracts to automate the transfer of ownership, particularly during the receipt of payments.

However, whether Indonesian law will give effect to these smart contract provisions is also unclear. The Basic Agrarian Law and the Government Regulation

[30]Robert Herian, *Regulating Blockchain: Critical Perspectives in Law and Technology* (United States of America: Routledge, 2018). p. 134

[31]Herian, *Regulating Blockchain: Critical Perspectives in Law and Technology*. p. 77

on Land Registration do not mention the term "smart contracts," leaving a huge gap in the legal framework. This evidently shows a void that can only be filled through legal reform aimed at the specific recognition and admissibility of these digital agreements, fitting them into broader legislation on contracts in Indonesia so that a conduct of smart contracts in land transactions can be enforceable.

Liability is yet another key issue in blockchain-based land registration. Whereas, in a government-to-government system, such as Indonesia's, upholding land record accuracy and dispute resolution would be the responsibility of the governing government agency, Indonesia's BPN. Liability in a decentralized blockchain becomes a very gray area. For example, if there were an error or some fraudulent data on the blockchain, it would become very difficult to establish who would be liable. The issue of responsibility becomes complicated due to the decentralized aspect of blockchain, meaning there is no central entity to oversee the system. By its very nature, where there is no central entity to oversee the system, the issues of liability need legal reforms so that issues regarding liability are clearly stated, thus offering protection of whatever kind to the parties involved in land transactions using blockchain technology under the law.

However, upon these challenges, blockchain technology bestows enormous opportunities for legal reforms in Indonesia. In reducing the gaps and the impediments involved with blockchain, Indonesia is more poised to formulate a stronger legal framework that recognizes most of the new technology and boosts the country's land registration. Areas under reform could tend towards the amendment of existing land laws in a way that specifically provides for the recognition of blockchain-based records and smart contracts as valid or enforceable by law. Such will include the amendment of the Basic Agrarian Law and the Government Regulation relating to registration of the land so that digital records and contracts are permissible in the regime, which will give legal certainty to blockchain-based land transactions.

Other than amending the existing laws, it would also be beneficial if Indonesia could develop new regulatory frameworks tailor-made to control blockchain-based land registration systems. Such frameworks would need to take into consideration issues of data privacy, security, and liability, ensuring that

blockchain technology is used responsibly and in line with the law. Furthermore, these regulators could draw on international best practice, including the blockchain land registry models implemented in countries such as Sweden and Georgia. This can serve to make the regulatory framework for Indonesia innovative in its own right, while maintaining global best practice by drawing in successful models from other jurisdictions.

C. CONCLUSION

In fact, regarding the land registration system in Indonesia, blockchain technology will certainly provide improved efficiency, transparency, and security. However, further realization of this successful application of blockchain will remain dependent on careful attention to the existing land registration law, and regulation on information technology. No doubt, however, several basic benefits of blockchain, such as minimizing the chance of fraud and increasing the speed of transactions, cannot hold back several legal issues regarding the use of this technology. These challenges include data privacy concerns, enforceability of smart contracts, and assignment of liability in decentralized systems.

The adoption of the blockchain in the process of recording its land assets in Indonesia will require legal reforms. Existing laws, such as the Basic Agrarian Law and the Government Regulation on Land Registration, were not crafted taking into account the existence of blockchain technology and will need amendments toward recognition of records on the blockchain and smart contracts as legally valid and enforceable.

However, the information technology law—the ITE Law should be aligned with the land registration regulations, so the blockchain-based systems will comply with the needed legal requirements prevailing in the laws, with regard to security, reliability, and secrecy of the blockchain systems, as well as liability clarification. Certainly, more research needs to be done to ascertain the kind of legal reforms that will be necessary to enable the use of blockchain technology with respect to the land registry in Indonesia. It is, therefore, incumbent upon policymakers to consider international case studies such as that of Sweden and Georgia, and other states that have been successful in deploying blockchain technology to their land registry

systems. In more useful human terms, the creation of new regulatory regimes will manage to deal with the unusual challenges that blockchain throws up: data protection, security, and the level of government oversight in a decentralized system. These frameworks must be forward-looking, adaptive to future technological developments, while ensuring the long-term viability of land registration based on blockchain in Indonesia.

The application of blockchain technology, therefore, turns out to give much promise in the solution of most of the challenges that affect the land registration systems of Indonesia. This, however, is going to need an earnest effort to reform existing laws and formulate new regulations to aggressively address unique aspects that novel blockchain embodies. This would amount to a modernization of Indonesia's land registration system and set a standard for adopting cutting-edge technologies in public administration. The effects of the blockchain go beyond the registration of land; they bring about transparency, reduce corruption, and build confidence in government institutions.

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