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**Securing Property Rights in
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Securing Property Rights in India through Distributed Ledger Technology

ABSTRACT

India registered rapid economic growth over the past couple of years, with the GDP growing 7.6 percent in 2015-2016. While economic activity remains buoyant, however, the country still has a long way to go. The government must capitalise on the current economic momentum and use it to accelerate its reform agenda. One of the areas requiring regulatory attention is the property market. Despite a push for reform through the Digital India Land Records Modernization Programme (DILRMP), India's current land title system remains plagued with deficiencies. There is a need for a standardised property rights regime if India aims to be an economic powerhouse. To bolster current systems, a decentralised, open, and transparent method of record-keeping must be introduced, supplemented by a legal framework capable of guaranteeing and enforcing property rights. A possible solution to the current record-keeping conundrum lies in blockchain technology.

INTRODUCTION

Over the past couple of years, India has registered rapid economic growth, with the GDP growing 7.6 percent in the last fiscal year.¹ The country's economic profile has also witnessed a shift over a long period—from rural-based agricultural production to urban economic activities, and from low-

value manufacturing to high-value services.² The economy is on track to maintain its growth rate for 2016. While economic activity remains buoyant, the country still has a long way to go. The Modi government must capitalise on the current economic momentum and use it to accelerate its reform agenda.

One of the areas requiring regulatory attention is the property market. After all, a robust property rights system is a prerequisite for sustained economic growth.³ Secure tenure has been shown to lead to greater land market efficiency, ensure greater access to formal channels of credit, incentivise investment in physical and human capital, strengthen growth performance, reduce macroeconomic volatility, and encourage equitable and efficient distribution of economic opportunity.⁴

The world is currently in the midst of a post-industrial digital revolution—epitomised by information intensity, connectivity, specialisation, and globalisation.⁵ This new technological era has the potential to enable an ecosystem in which society is motivated by collaborative interests rather than individual gain. To harvest the benefits of this technology-centric paradigm, the Modi government launched the ambitious Digital India Mission in 2014, whose cornerstone is the provision of reliable and current data to facilitate efficient delivery of government services.⁶ Yet, the information architecture that houses this data currently resides in a set of disparate databases. The current system still allows for the alteration or manipulation of data with relative ease. This problem is especially pervasive in the case of land records. The centralised control over the land records and registration systems in the States offers minimal transparency and accountability.⁷ As a result, critical data is often unavailable, leading to inordinate delays in real-time decision-making. Poor land record-keeping makes buying land difficult, leading, in turn, to delays in infrastructure projects.⁸ Land is often acquired for development projects, but the 7/12 land extract (an extract from the land register maintained by the revenue department) does not

reflect these changes. Fraudulent land transactions are rampant as a result of this administrative deficiency.⁹ In certain cases, people mortgage government-acquired properties to obtain bank loans.¹⁰ Though a central government program to digitise and update land records was relaunched in 2016—the Digital India Land Records Modernization Program (DILRMP)—it is still left open to similar iniquities.

India must institute a standardised property rights regime if it aims to be an economic powerhouse. To bolster current systems, a decentralised, open, and transparent method of record-keeping needs to be introduced. This must be supplemented by a legal framework capable of guaranteeing and enforcing property rights. A possible solution to the current record-keeping conundrum lies in blockchain technology.

THE ECONOMICS OF LAND REGISTRATION

The analytical discussion of the economic benefits of land titling and registration has evolved—from theoretical discussion and descriptive statistics to a discussion based on increasingly rigorous quantitative analyses.¹¹ Significant efforts have been made by researchers across the globe to quantify the economic benefits of secure ownership, in general, and land registration systems in particular. For example, a study in India found that land registration leads to significant interest payment savings.¹² The quantification of economic impacts is relevant to policy-makers, as it helps demarcate potentially worthy targets for public spending.

The impact of land registration on investment has also been thoroughly examined in many parts of the world. In Costa Rica, for example, it was found that a correlation existed between the degree of tenure security and farm investment per unit of land.¹³ Meanwhile, in Thailand, land titling was found to stimulate land transactions,¹⁴ and in Indonesia, it was established that higher security of tenure led to higher land prices.¹⁵

Peruvian economist, Hernando De Soto, is among the leading proponents of the merits of secure tenure. He argues that the lack of a formal property rights system is the root cause of poverty in developing nations and is responsible for the proliferation of informal real estate and employment sectors. He coined the term, 'dead capital', to refer to assets that cannot be easily transacted, valued or used for investment. Slums are a good example of dead capital, as their residents are scarcely able to realise the economic potential of the land they live on. Through empirical studies, De Soto calculated that the total value of dead capital in the Global South is around USD 9.3 trillion.¹⁶ He says that with the introduction of a formal property regime, the poor can begin to look at their assets as more than just shelter, and begin to leverage property to gain access to credit and grow their business. It is important to note that De Soto is currently assisting Georgia's effort to develop a blockchain land registry.¹⁷

INDIA'S LAND ADMINISTRATION SYSTEM

Before discussing how blockchain technology can effect better land administration outcomes, it is important to understand the key features of India's land administration system. A distinction exists between land records and land registration and the way in which these recordings have evolved historically. Land records were introduced swiftly in India after colonisation, in rural areas with agricultural potential.¹⁸ Forests and urban areas were excluded from the purview of this recording system. Land records aimed not to document rights but to collect taxes. Land revenue became the main source of government income throughout the colonial period.¹⁹ The system of registration of documents concerning transfers of immovable property was first introduced by the Bengal Regulation XXXVI of 1793, the Bombay Regulation IV of 1802, and the Madras Regulation XVII of 1802.²⁰ The Acts authorised the Registrar to register sale deeds, gift deeds, mortgage deeds, wills, and leases.²¹ These were followed by a series of enactments which culminated in the Registration Act of 1908. The

Registration Act applied to all British Indian provinces, providing for the registration of all documents related to the transfer of immovable property. Things remained largely the same after Independence. The newly independent Indian regime kept the colonial system for land records and land registration largely intact.²² Rural areas depend primarily on land records maintained by the Revenue Department, whereas in urban settlements, people are more reliant on registration of deeds through the Stamps and Registration Department. Since Independence, the general assessment of land reforms in the Indian context has been underwhelming. According to a report by the erstwhile Planning Commission's Task Force on Agrarian Relations, the large gaps between policy and legislation, and between the law and its implementation, are to be blamed on general political insouciance.²³

Under the Constitution, States in India are vested with the responsibility of maintaining land records. Specifically, entries 18 and 45 in List II of the Seventh Schedule clearly state that Land and all allied activities come under the domain of the States. At the national level, the Department of Land Resources in the Union Ministry of Rural Development has the mandate to address land policy issues. In the States, the Revenue Department manages land records, the Department of Stamps and Registration oversees registration, and the Survey Department carries out land surveys. At the *taluk* or *tehsil* level, the officer in charge of maintenance of land records is the Tehsildar. At the circle level, land records are in the custody of the Revenue Inspector and Circle Inspector. The Village Accountant (VA) is usually in charge of a single village or a group of villages. The VA rounds out the sub-stratum of land administration system.

During the Seventh Plan in 1987-88, a centrally sponsored scheme on the Computerization of Land Records was introduced as a pilot project in certain districts across the country. The scheme, however, made little progress. Some of the operational problems included a delay in the

development of a need-based software, poor computer training facilities for field revenue staff, a dearth of private contractors to update data, and a general lack of administrative focus.²⁴

The Current State of Titles in India

In 2008 the National Land Records Modernization Programme was launched, aiming to modernise the management of land records, minimise the scope of land/property disputes, foster transparency in the land records maintenance system, and gradually move towards guaranteed conclusive titles to immovable property. Under this initiative, land records are supposed to be computerised in all districts of the country by 2017 using a Public-Private-Partnership model. The scheme did not make much headway as the costs of implementation proved a challenge.

Recently, the digitisation of land records was relaunched under the Digital India Land Records Modernization Programme, for which the 2016 Budget allocated INR 150 crores. The relaunched project is slated to include the following: computerisation of all land records including mutations; digitisation of maps and integration of textual and spatial data; survey/re-survey and updating of all survey and settlement records, including creation of original cadastral records wherever necessary; computerisation of registration and its integration with the land records maintenance system; development of core Geospatial Information System (GIS); and capacity building. Overall, this scheme is a positive first step towards creating a robust formal property system. There are, however, some issues with its implementation.

Issues with the Current System

The records maintained by the authorities are primarily used for fiscal purposes. The function of providing proof of title is purely ancillary to the purpose of collecting land revenue. Thus, titles to land are purely presumptive. Registration only puts an agreement between two parties on

public notice but says nothing about the legal validity of the underlying transaction. This leaves titles secured through registration open to challenge in the courts of law. The Indian judicial system is currently buckling under the weight of a three-crore case backlog, 70 percent of which pertain to disputes regarding land or property.²⁵ Registrars will register any instrument received without checking its validity in the absence of countervailing claims. The Registration Act, 1908 does not require vetting the validity of documents and transactions.²⁶

Due to a lack of coordination between the various nodal agencies handling land records, the information registered is not standardised. This leads to ambiguity in terms of the nature of rights being transferred by the transaction and the boundaries of the land being transacted. Further, records are not updated promptly. Thus, they rarely reflect the true nature of ownership of a particular parcel of land. A report of the CAG showed that there was a backlog of some 124,325 cases for registration of property in 2015.

The current system is rife with corruption. Experts estimate that each year, USD 700 million in bribes are being exchanged at registrar offices across the country. The system has also led to the proliferation of an informal credit sector. Most poor farmers in India, due to a lack of formal title to their land, cannot use it as collateral against a credit transaction. As a result, formal credit institutions are inaccessible to most farmers, leaving them at the mercy of informal moneylenders.

The DILRMP is still heavily reliant on government functionaries to act as trusted third parties to process deeds and verify data. This leaves the system vulnerable to inefficiency and iniquity. Recent data from the DILRMP show that in most States, the digital land record database has not been integrated with the digitised land registration database. This deficiency of data hinders the seamless verification of documents submitted for registration. VAs and *patwaris* tend to display apathy

towards cross-referencing and verifying data, resulting in innumerable delays. This system is also vulnerable to cyber-attacks. A cyber-attack on a digital land registry could result in the loss or theft of important data.

BLOCKCHAIN TECHNOLOGY

What is 'blockchain' and how does it work?

The idea of the 'blockchain' first came about in 2008, when a person or a group of people going by the pseudonymous 'Satoshi Nakamoto' published a paper detailing the workings of a peer-to-peer electronic cash system that dis-intermediated financial institutions: Bitcoin. The blockchain was the technology underpinning the Bitcoin electronic cash system. Bitcoin was the currency of choice for nefarious networks like the infamous 'Silk Road' – an online marketplace for people peddling contraband. Since then, however, blockchain has attained a new identity in enterprise. Many financial institutions and firms across industries are experimenting with this technology as a secure and transparent way to digitally track the ownership of assets and the verifiability of transactions. Some countries are now turning to blockchain technologies to address inefficiencies in current systems and increase the effectiveness of public service delivery.

A blockchain is a data structure that makes it possible to create a digital record of transactions and share it across a distributed network of computers. Through cryptography, each participant on the network may manipulate the ledger in a safe way without the need for a central authority.

Each block comprises a unique hash. The transaction is distilled down to a code known as the hash value. A hash is the digital fingerprint of a particular transaction. Each computer in the blockchain's network is called a node. Each node has a copy of the entire ledger and works with other nodes to maintain the ledger's consistency. This creates a redundancy in the system. If any node disappears or goes down, all is not lost. A

consensus mechanism is a set of rules the network uses to verify each transaction and agree on the current state of the blockchain.

Once a block of data is recorded on the blockchain ledger, it becomes extremely difficult to change or move. If someone wants to add to the blockchain, participants in the network – all of whom have copies of the existing blockchain – run algorithms to evaluate and verify the proposed transaction. The transaction's hash has to match the blockchain's history. If the majority of the nodes reach a consensus as to the transaction's validity, then it will be approved and added to the ledger. Blockchain is a transparent platform, the workings of which are open to examination and elaboration.

Particular attention is being paid to how blockchains can be used for registries. A blockchain is an instrument that ensures veracity, making it the perfect recording system for anything worth tracking closely. At present, blockchain technology is being used to track diamond transactions, act as a notary, and store personal information in a way that does away with passwords. Though this mechanism still relies on an intermediary to store data accurately, there are ways to circumscribe its ability to influence the nature of the data such as through 'smart contracts'.

Smart contracts are contracts that have been distilled into code. Smart contracts enable adding supplementary information to what is already stored in the blockchain to regulate data authorisation and storage. They self-verify their conditions using data and then execute themselves. They are tamper-resistant because they are run and stored on a network of computers that is beyond the influence of the contract's participants. Since none of the contract's participants can influence the smart contract beyond the actual performance of their obligations, all the participants can trust that this type of contract will be executed as it is written.

At present, Estonia, Honduras, Georgia, Ghana and Sweden are looking into blockchain-based land registry systems. Sweden is leading

this initiative with a working pilot in place that is looking at full-scale deployment soon. A study of existing systems could shed light on which system would be best for India to adopt.

The Swedish Blockchain Registry

Sweden's current land registration system lacks transparency and efficiency. As a result, private stakeholders developed a system to ensure the sanctity of agreements amongst themselves. Understanding the need for change, the Lantmateriet (The Swedish Mapping, Cadastre and Land Registration Authority) collaborated with Kairos Future (a consultancy), The Telia Company (Sweden's dominant tele-network operator), and Chroma Way (a blockchain solutions firm) to develop an innovative way to address the issues plaguing the current land registry framework. They devised a plan to create an application that would use blockchain technology to facilitate transactions. Communication between the various stakeholders (real estate agent, bank, buyer, seller, and the Lantmateriet) is conducted over the application. All information about the property (current owner, cadastral surveys, among others) is digitised and put into the blockchain. Smart contracts then ensure that this digitised space is regulated by certain rules (i.e., Sweden's regulatory policies). The application is then used as an interface to facilitate all transactions concerning a particular property.²⁷ The purchase agreement is distilled down to a unique hash code and put into the blockchain. Banks, real estate agents, buyers and the Lantmateriet can substantiate the veracity of this purchase agreement and other documents through their unique digital signature (hash on the blockchain). Banks can also ensure that the buyer has enough funds in their account to carry out the transaction. The Lantmateriet can then register and grant title to the buyer. This project is currently in the pilot phase.

The beauty of this program is that it allows for lateral operations. Linear progressions are generally slow and tedious. Here many different

procedures, activities, and formalities can be carried out simultaneously through a single, open and transparent platform.

The Potential of a Blockchain Land Registry in India

Before a system like this is introduced in India, certain prerequisites will have to be met. The following are the key enablers to drive implementation of blockchain technology in India:

- A provision for a basis for cryptographic trust through the establishment of a Public Key Infrastructure (PKI). PKI is a set of roles, policies, and procedures needed to create, manage, distribute, store and revoke digital certificates. Blockchains could then coalesce with each other and also with existing PKI amalgamations. This would go a long way in accelerating collaborative governance on any future project. The creation of a PKI is key for the successful implementation of a blockchain system in India.
- Leveraging a protocol, like the Uniform Economic Transfer Protocol (UETP) that links the buyer to the seller, the property, the payment, the bank, the smart contract, and the registry.
- Smartphones should be the de facto trusted user device. Efforts should be undertaken to ensure that cheap and indigenous smartphones have certain important security features, such as:
 - Securing digital certificates and cryptographic keys for authentication, encryption, and signing;
 - Ensuring that an operating system is not vulnerable to malware;
 - Near-field communication so the smartphones can interact securely with a user's Aadhar number.

These systems will provide the foundation for the successful implementation of a blockchain land registry in India.

The first step in establishing a robust PKI in India would be to consolidate the current institutional infrastructure governing land registration and titles. This entails the creation of a single department to manage registration, a record of rights and cadastral surveys. Consolidation of these three areas would facilitate greater coordination. It would also lead to an increase in accountability.

Potential Benefits of Implementation

Cost-effectiveness: Although initial implementation costs would be high, the blockchain provides a way of combining many processes and systems. This would increase efficiency through distributed processing and thus reduce long-term costs, such as a reduction in manpower of the concerned department.

Efficiency: The use of smartphones as one-stop-shop for all property-related transactions will significantly reduce the inefficiency of the current system. Most significantly, it will drastically cut down the number of intermediaries that deluge the current title regime. The tamper-proof nature of the blockchain also helps curb corruption as patwaris will not be able to go back and change land records in exchange for a bribe.

Transparency: Registration on the blockchain would mean that the information in the registry is completely available to the public. The CAG can be brought onto the platform as a stakeholder so that its office can view transactions and information uploads as they happen. If someone tries to tamper with the information, everyone can identify tampering at any point in time. While blockchains are not entirely hack-proof, protocols can be put in place to counter such attacks on the system. It will also make it impossible to transact land fraudulently.

Easing administrative burden: Land/property-related disputes currently make up 70 percent of the total case backlog in India. A robust land title

system will lead to a decrease in the number of land-related disputes in the country and, in turn, lessen the backlog in the country's courts.

Ideas for a Pilot Project

Rajasthan's legislative assembly recently passed the Rajasthan Urban Land (Certification of Titles) Act, 2016, making it the ideal location for a pilot blockchain project. The Act sets up the legal framework for granting legitimate rights to a property owner in the State. The Act provides that if a third person were to successfully challenge the title of a transaction between two parties, the government would have to ensure compensation for the buyer against the payment made. It also clearly defines the period within which people can dispute provisional certificates of title to property. The State also has a functional website which provides copies of the current Records of Rights. The tehsil with the highest per capita usage of mobile phones would be the ideal location to launch the pilot project.

Deployment should commence with re-surveying the land. At present, most cadastral maps in India date back to the British era. The Department of Land Resources is tapping agencies that provide Unmanned Aerial Vehicle (UAV) technology services to carry out the cadastral mapping process. Once concrete land parcels are established, all newly registered property (those with no formal titles or claims to them) can be registered directly on the blockchain. Title to other plots will have to be established through the issuance of a provisional certificate, and if the property is disputed, from the outcome of the dispute. To ensure quicker resolution of disputes, the Act can be amended to mandate that disputes under the Act be resolved within a year.

A flat rate transaction tax can be used to replace Stamp Duty on land transactions. This tax could be charged on the application itself – incorporated within the cost of the land parcel – and transferred directly to the concerned Government Department. While this does not do away with


Stamp Duty altogether, it eliminates the process of paying Stamp Duty to a collector—and the uncertainty that often accompanies it. Due to the Stamp Duty Act's ambiguous nature, there is often a disagreement between the Collector and the person trying to pay duty on the amount of duty owed. Collectors have also been known to use their position to harass the public. Thus, the payment of Stamp Duty in itself is a precipitator for a lot of litigation. Rates vary across States and the Stamp Duty Act itself is a non-comprehensive, tedious piece of legislation. Incorporating the tax directly within the transaction amount would also prevent tax evasion.

THE FUTURE OF A BLOCKCHAIN REGISTRY IN INDIA

There are a number of impediments to the implementation of a Blockchain land registry in India. For one, it requires extensive legislative and administrative overhaul, starting with an amendment of the Constitution and the introduction of a comprehensive Titling Act. It will also require a reconfiguration of the administrative regime currently overseeing land records. Overcoming these structural barriers will be arduous, to say the least. However, the blockchain ledger would be toothless without legislative support. Entries in the ledger would still only provide for presumptive titles under the current legal framework and thus a conclusive land titling law must be passed to mitigate future disputes.

There are also a number of infrastructural deficits. At present, only 34.8 percent of the Indian population has access to the internet.²⁸ This lack of access, along with poor literacy rates and abject poverty, act as major roadblocks to expanding the reach of any digital application.²⁹ And though mobile data plans are priced competitively, they are still too expensive for a majority of the Indian people.³⁰ A positive development in this regard is the ambitious Pruthvi project. Saankhya Labs in Bengaluru has developed a chip that uses television White Space, or wasted spectrum bandwidth, to supply internet to scores of rural households.³¹ The project is currently in the field-trial stage.³²

The new property regime would considerably cut down the role of government intermediaries in facilitating property transactions. The company partnering with the government on this initiative will be responsible for uploading the initial data on the blockchain. The blockchain can be programmed to establish the veracity of this data through the use of smart contracts. Smart contracts will ensure that transactions and titles adhere to the policies and regulations put in place by the government. They can also be programmed to access court registries when disputes are resolved and titles granted, cadastral surveys and other public records to determine the accuracy of titles. Intermediaries, then, are only to observe the network and raise the alarm if there is any evidence of tampering. Even if they graduate to entering the data themselves, they cannot cheat the system as it will not accept a change that does not match the information in the public records.

Despite the sizable barriers to implementation and adoption, the current government's fervor for digitisation helps maintain an optimistic outlook towards the future of this technology. If the government can help overcome infrastructural, institutional and regulatory hurdles, the blockchain land registry, coupled with robust titling legislation, may yet prove to be the best way to deliver a secure, transparent and efficient land records system in India. It will help expunge many of the deficiencies inundating the current system. As stated earlier, the technology offers an innovative solution to a variety of issues plaguing the country. And while it is by no means a panacea, it carries advantages that far outweigh any negatives that may ensue from its implementation. 

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