



REIMAGINING INDIA'S PUBLIC REGISTRY ECOSYSTEM

A Policy Report on Blockchain Use Cases

September, 2025



REIMAGINING INDIA'S PUBLIC REGISTRIES USING BLOCKCHAIN TECHNOLOGY

SEPTEMBER 2025

Digital India Foundation (DIF) is a not-for-profit think-tank aiming to foster digital inclusion and adoption, and the use of the Internet and related technologies for the developmental process. For more information, please visit:
www.digitalindiafoundation.org

©2025 Digital India Foundation All rights reserved.

No part of this publication may be reproduced or transmitted in any form or by any means without permission in writing from Digital India Foundation

contact@digitalindiafoundation.org | www.digitalindiafoundation.org

TABLE OF CONTENTS

LIST OF ABBREVIATIONS.....	4
EXECUTIVE SUMMARY.....	6
I. INTRODUCTION.....	8
1.1. Understanding Blockchain Technology in the Context of Public Infrastructure.....	8
II. BLOCKCHAIN-ENABLED SOLUTIONS FOR CROSS-BORDER FINANCE.....	10
2.1. Global Examples.....	11
2.2. Regulatory Concerns.....	12
III. IMPROVING CROSS-BORDER TRADE WITH BLOCKCHAIN.....	14
3.1. Key Opportunities for Blockchain in Cross-Border Trade.....	14
3.2. Global Precedents in Blockchain-Enabled Trade Infrastructure.....	15
IV. SECURE DIGITAL PUBLIC REGISTRY ECOSYSTEM USING BLOCKCHAIN TECHNOLOGY.....	17
4.1. Current Landscape and Policy Context.....	17
4.2. Global Precedents in Blockchain-Based Land Registries.....	19
4.3. Enabling Technologies for Blockchain-Based Registry Ecosystem.....	19
4.4. Towards Tokenised Registries and Digital Asset Systems.....	20
4.5. Challenges to the Adoption of Blockchain Technology in the Public Registry System in India.....	21
V. SUTRA: A FRAMEWORK FOR TRUST-BASED REGISTRIES.....	24
VI. RECOMMENDATIONS.....	26

LIST OF ABBREVIATIONS

Abbreviation	Full Form
AA	Account Aggregator
AML	Anti-Money Laundering
CBDC	Central Bank Digital Currency
DeFi	Decentralised Finance
DIF	Digital India Foundation
DILRMP	Digital India Land Records Modernisation Programme
DPI	Digital Public Infrastructure
eKYC	Electronic Know Your Customer
ESG	Environmental, Social, and Governance
FIU-IND	Financial Intelligence Unit - India
FX	Foreign Exchange
GIS	Geographic Information System
IFSCA	International Financial Services Centres Authority
IMF	International Monetary Fund
IMDA	Infocomm Media Development Authority (Singapore)
INR	Indian Rupee
IPA	Indian Ports Association
KYC	Know Your Customer
MAS	Monetary Authority of Singapore
MeitY	Ministry of Electronics and Information Technology
MiCA	Markets in Crypto-Assets (EU Regulation)

MiFID	Markets in Financial Instruments Directive (EU)
MSME	Micro, Small and Medium Enterprises
NAKSHA	New Automatic Khasra Survey for Housing & Architecture (UP GIS pilot)
NAP	National Agency of Public Registry (Georgia)
NGDRS	National Generic Document Registration System
NPA	Non-Performing Asset
PCS	Port Community System
RBI	Reserve Bank of India
REIT	Real Estate Investment Trust
SEBI	Securities and Exchange Board of India
SMEs	Small and Medium Enterprises
SUTRA	Shared and Unified Trust Registry Architecture
SVAMITVA	Survey of Villages and Mapping with Improved Technology in Village Areas
TDS	Tax Deducted at Source
ULPIN	Unique Land Parcel Identification Number
ULI	Unified Lending Interface
UN	United Nations
USD	United States Dollar
USDC	USD Coin (a USD-backed stablecoin)
UPI	Unified Payments Interface
VDA	Virtual Digital Asset
WTO	World Trade Organisation

EXECUTIVE SUMMARY

India is well-positioned to shape the next phase of digital infrastructure by leveraging blockchain to create verifiable, modular, and interoperable registries across various sectors, including finance, trade, and land records. As interest grows in programmable money, tokenised assets, and paperless trade, blockchain provides a strong technical foundation for transparency, auditability, and secure data exchange across institutions, both public and private.

To explore this potential, Digital India Foundation and the SUTRA initiative hosted a high-level multi-stakeholder roundtable in New Delhi on July 22, 2025. The discussion focused on three priority use cases: INR-backed stablecoins for cross-border finance, cross-border trade facilitation, and secure digital public registries.

This report identifies three important use cases of blockchain technology :

- **INR-Backed Stablecoins for Cross-Border Finance:** With remittances, trade, and welfare delivery increasingly going digital, INR-pegged stablecoins can offer faster, cheaper, and programmable financial rails.
- **Blockchain for Cross-Border Trade Facilitation:** By anchoring documents on-chain and integrating with customs systems, blockchain can reduce paperwork, fraud, and delays in cross-border transactions. It also opens up faster credit access and ESG-linked finance for MSMEs.
- **Secure, Auditable Land and Property Registries:** Despite partial digitisation, India's land records remain fragmented and prone to disputes. Blockchain, when combined with geospatial technology and Aadhaar-linked identity systems, can enhance transparency, reduce fraud, and foster trust. But the absence of indemnity frameworks and interoperable standards continues to hamper scale.

In the sections that follow, the report sets out key recommendations informed by expert insights and stakeholder input. Some of them are as follows:

- **Stablecoins:** Establish issuance rules, reserve backing norms, and initiate sandbox pilots to explore cross-border applications.
- **Trade Facilitation:** Tokenise trade assets and embed smart contract-based credit mechanisms to reduce friction in export workflows.
- **Legal Infrastructure:** Define the enforceability of tokenised documents and contracts to enable adoption across sectors.
- **Integration with Trade Platforms:** Align blockchain pilots with existing systems like ICEGATE and customs for operational scalability.

- **Taxation:** Reduce TDS to 0.1%-0.01% as a tracking tool, maintain 30% capital gains on fiat conversion with loss offset provisions, and simplify compliance to encourage onshore trading and strengthen the domestic VDA ecosystem.
- **Land Registries:** Adopt a phased rollout starting with urban areas and develop indemnity frameworks to build trust in on-chain records.

I. INTRODUCTION

On 22nd July 2025, the Digital India Foundation (DIF), in partnership with the Shared and Unified Trust Registry Architecture (SUTRA) initiative, hosted a closed-door roundtable in New Delhi focused on how blockchain could address trust, verification, and coordination challenges across key public systems. Rather than treating blockchain as a standalone technology, the roundtable examined its potential as a foundational layer that can enhance the functionality of registries, automate rule-based processes, and reduce dependency on fragmented data systems.

The discussion was anchored around three high-impact and institutionally grounded use cases:

- (1) improving cross-border finance using INR-backed stablecoins,
- (2) streamlining trade documentation and payments through tokenised, programmable flows, and
- (3) building verifiable, tamper-evident public registries, especially in the domain of land and property ownership.

Each of these areas was selected for its combination of operational relevance, regulatory complexity, and potential to unlock systemic efficiencies. The roundtable brought together a cross-section of stakeholders, including policymakers, legal experts, blockchain entrepreneurs, and public sector technologists, who contributed practical insights from global pilots, Indian regulatory experiments, and existing state-level initiatives.

India is not starting from scratch. From land record pilots in Uttar Pradesh and Tamil Nadu, to emerging tokenisation efforts in trade finance and stablecoin experiments within regulatory sandboxes, the building blocks for blockchain adoption are already taking shape. Yet challenges around legal clarity, tax treatment, and data reliability continue to hinder scalable deployment.

This document captures the key insights and recommendations from the roundtable, drawing on real-world examples and grounded institutional contexts. It aims to inform both ongoing policy discussions and emerging implementation strategies for blockchain-based registries and financial systems in India.

1.1. Understanding Blockchain Technology in the Context of Public Infrastructure

Blockchain is increasingly recognised as a foundational technology for reimagining how data, transactions, and trust are managed across digital ecosystems. At its core, blockchain is a tamper-proof, decentralised ledger that records transactions in a verifiable and immutable way. Unlike traditional databases controlled by a central authority, blockchain operates on distributed networks with built-in cryptographic safeguards and consensus mechanisms, making it highly

resilient and transparent. This unique architecture enables parties with limited trust to coordinate securely, giving rise to what many now call a “trust machine”.

While public blockchains like Bitcoin popularised the technology, the current wave of innovation is being driven by permissioned and consortium blockchains tailored for use cases in finance, trade, and governance. These systems allow controlled participation while maintaining data integrity and auditability, making them ideal for public registries that require accountability, verifiability, and legal robustness. Smart contracts, programmable rules embedded on blockchain, further enable automation of workflows, conditional payments, and self-verifying transactions.

Critically, blockchain does not replace state capacity or existing legal frameworks. Rather, it strengthens them by encoding policy logic into programmable systems, automating conditional workflows, and reducing reliance on paper-based attestations or fragmented IT infrastructure. When combined with domain-specific identifiers, cryptographic credentials, or tokenised instruments, it can enable faster settlements, conditional entitlements, and verifiable registries that are interoperable by design.

In the Indian context, this potential intersects with a broader effort to re-architect digital systems around modularity, legal enforceability, and inclusion. From INR-backed stablecoins for real-time remittances, to programmable customs and payment flows in trade corridors, to tamper-evident property records and tokenised credentials, blockchain is being explored not as a singular solution, but as a unifying technical layer across diverse governance and transactional workflows.

The discussions at the roundtable reflected this shift in thinking: away from blockchain as a disruptive technology, and towards blockchain as an enabling substrate for next-generation public infrastructure that can enhance both institutional accountability and user autonomy.

The following sections provide a detailed exploration of each use case discussed at the roundtable.

II. BLOCKCHAIN-ENABLED SOLUTIONS FOR CROSS-BORDER FINANCE

As global trade expands, cross-border payments have become a critical financial infrastructure component. As per a 2025 IMF working paper, the global cross-border traditional and crypto payment market approached a value of about one thousand trillion dollars in 2024.¹ Even though crypto payments represent only a small fraction of this value, despite their recent surge, blockchain's initial success has been most visible in cross-border finance, where it reduces reliance on intermediaries and enables near-instant settlement.

In the context of the rapid expansion of cross-border trade, the persistent challenges associated with traditional cross-border payment systems have led to a growing demand for the transformation of conventional business models in this domain. Correspondent banking, which enables one bank to make cross-border payments through another bank, for example, is the most dominant model for conventional cross-border payment², and has several key drawbacks. It involves long chains of intermediaries, which increase transaction costs and cause delays, especially in countries with less common currencies. The system is dominated by large financial institutions, reducing space for innovation and competition. Many individuals still remain outside the formal financial system, limiting their ability to save, invest, or access credit. This deepens inequality, slows development, and contributes to a growing informal or shadow economy.

In response, emerging technologies, particularly blockchain, are reshaping the foundations of payment infrastructure. With its decentralised architecture, immutability, and transparency, blockchain is well-suited for cross-border payments, offering the potential to significantly enhance both efficiency and security in processing cross-border payments. The decentralised nature of blockchain allows technology startups to enter the normally high-entry-barrier sector and provide more flexible and affordable financial services, especially with stablecoin applications.³ Stablecoins, with their balance between centralised and decentralised models, offer a more suitable medium of exchange compared to typical cryptocurrencies. When issued under regulatory frameworks established by central banks or financial authorities, they can combine the benefits of programmability and trust, enabling safer integration into mainstream finance and cross-border use cases.

¹Eugenio M. Cerutti, Melih Firat, and Martina Hengge, "Global Cross-Border Payments: A \$1 Quadrillion Evolving Market?" *IMF Working Papers* 2025, no. 120 (2025), accessed July 28, 2025, <https://doi.org/10.5089/9798229013505.001>.

²World Bank, "Remittance Prices Worldwide," 2022, accessed September 26, 2025, <https://remittanceprices.worldbank.org/corridor/South-Africa/Zimbabwe>.

³Xian Zhuo, Felix Irresberger, and Deneba Bostandzic, "Blockchain for Cross-Border Payments and Financial Inclusion: The Case of Stellar Network," SSRN, November 25, 2023, <https://ssrn.com/abstract=4550837> or <http://dx.doi.org/10.2139/ssrn.4550837>.

Stablecoins are cryptocurrencies designed to maintain a stable value by pegging their value to a specific asset or a basket of assets (e.g., fiat currency and gold). It gained prominence following the 2018 crypto market correction, which highlighted the volatility of unbacked cryptocurrencies as a means of payment.⁴ Due to its low fluctuation and close connection to the conventional financial system, stablecoins can facilitate efficient movement and exchange of currencies and open opportunities to reshape cross-border payments and promote financial inclusion.

This roundtable highlighted the potential of INR-pegged stablecoins for cross-border remittances, trade, and inclusion. Unlike volatile cryptocurrencies, these digital tokens are backed 1:1 by Indian rupees, enabling secure, traceable transactions. Building on this, the discussion highlighted how an INR-backed stablecoin could unlock significant benefits across remittances, trade settlements, and public service delivery:

- **Remittances:** Indians working abroad sent home a record \$135.46 billion in FY 2024–25, making India the top remittance recipient globally, far ahead of second-placed Mexico (\$68 billion).⁵ INR stablecoins can reduce transfer costs and delays, ensuring more value reaches families back home.
- **Trade Settlements:** Indian SMEs often rely on USD for cross-border payments, exposing them to forex risks and delays. Using INR-pegged stablecoins can enable faster settlement in local currency, improving liquidity and reducing dependence on dollar financing.
- **Micropayments & Public Disbursements:** INR-backed stablecoins can enable real-time, low-cost delivery of government welfare payments, subsidies, and micro-insurance premiums directly to citizens' digital wallets, improving transparency, reducing leakages, and ensuring faster access to entitlements.

2.1. Global Examples

Several countries are actively piloting or adopting stablecoin frameworks to improve cross-border payments, trade efficiency, and financial inclusion. Notable examples include:

- **UAE:** Dirham-Backed Stablecoin Framework (2024). The Central Bank of the UAE issued guidelines in 2024 allowing licensed issuance of dirham-backed stablecoins for domestic and cross-border use. UAE is positioning itself as a regulated hub for fiat-backed

⁴ Financial Stability Board (FSB). 2020. "Addressing the Regulatory, Supervisory and Oversight Challenges Raised by 'Global Stablecoin' Arrangements." <https://www.fsb.org/2020/04/addressing-the-regulatory-supervisory-and-oversight-challenges-raised-by-global-stablecoin-arrangements-consultative-document/>.

⁵ NewsOnAir. 2025. "Remittances by Indians Working Abroad Scale Record High of \$135 Billion in FY25." <https://www.newsonair.gov.in/remittances-by-indians-working-abroad-scale-record-high-of-135-billion-in-fy25>.

stablecoins, especially for Gulf-Asia trade corridors and remittance-heavy regions like India, Pakistan, and the Philippines.⁶

- **Singapore:** Project Guardian (MAS), The Monetary Authority of Singapore (MAS) is leading Project Guardian, which includes pilots using tokenised bank liabilities and regulated stablecoins for instant trade finance, foreign exchange, and asset settlement. Singapore also released a clear regulatory framework for stablecoins in 2023, requiring full backing, reserve audits, and capital requirements.⁷
- **Philippines:** USDC Pilot for Remittances. The Philippines, one of the top remittance-receiving countries, has partnered with different platforms to test USDC-based remittance corridors from the U.S. to the Philippines. The focus is on reducing fees and improving speed for overseas Filipino workers.⁸
- **Colombia:** Stablecoins for Government Aid Distribution. In collaboration with private fintechs, Colombia has explored using stablecoins pegged to the peso to distribute government subsidies and aid in remote or unbanked areas, increasing efficiency and reducing corruption in disbursements.⁹
- **Finland/EU:** EUROe by Membrane Finance, the first EU-regulated euro-backed stablecoin under the MiCA framework. It is fully reserved, MiFID-compliant, and used in pilot settlements for DeFi, fintech, and cross-border payments across the EU zone.¹⁰

In India, participants noted that certain fintechs have quietly experimented with stablecoins on private blockchains for corporate remittances, but a lack of clarity on issuance authority and reserve requirements has limited scale.

2.2. Regulatory Concerns

The following concerns and policy enablers were identified and deliberated upon by participants during the discussion.

- **Lack of Legal Recognition and Market Certainty**
Stablecoins fall under the tax definition of Virtual Digital Assets (VDAs). Participants noted that there is no specific law defining their legal status, permissible use cases, or issuer

⁶ PricewaterhouseCoopers (PwC). 2025. Unlocking the Future of Finance with Stablecoins. <https://www.pwc.com/ml/en/publications/2025/docs/unlocking-the-future-of-finance-with-stablecoins.pdf>.

⁷ Monetary Authority of Singapore. "MAS Finalises Stablecoin Regulatory Framework." Singapore, 2023. <https://www.mas.gov.sg/news/media-releases/2023/mas-finalises-stablecoin-regulatory-framework>.

⁸ Bertillo, Shiela. "Coins.ph, Circle Partner to Promote USDC Remittances." *BitPinas*, October 12, 2023. <https://bitpinas.com/business/coins-ph-circle-usdc-remittances/>.

⁹ Sandor, Krisztian. "Colombian Peso Stablecoin Goes Live on Polygon, Aiming for \$10B Remittances Market." *CoinDesk*, August 24, 2023. <https://www.coindesk.com/business/2023/08/24/colombian-peso-stablecoin-goes-live-on-polygon-aiming-for-10b-remittances-market>.

¹⁰ Membrane Finance Oy. "Why EUROe?" *EUROe*. <https://www.euroe.com/why-euroe>.

obligations. This absence of statutory recognition leads to hesitation among institutions, inhibits product innovation, and leaves users without clear recourse in case of disputes.

➤ **Adverse Tax Treatment and Lack of Loss Offset Provisions**

The prevailing tax regime imposes a flat 30% tax on profits from VDAs and a 1% tax deducted at source (TDS) on all transactions. Moreover, the inability to offset losses against gains disincentivises legitimate use cases such as digital payments or remittances, and instead frames all transactions under a speculative lens.

➤ **Monetary Sovereignty and USD Dominance**

India's crypto ecosystem is currently heavily reliant on USD-pegged stablecoins for on-chain liquidity and settlement. This overdependence introduces foreign exchange (FX) exposure risks and raises concerns over monetary sovereignty, particularly if domestic payment volumes continue to flow through dollar-denominated tokens.

➤ **Regulatory Fragmentation and Compliance Gaps**

Participants noted that while stablecoins are legally tradable as Virtual Digital Assets (VDAs) in India, their oversight remains fragmented. There is no single authority designated to govern their issuance, usage, or compliance. Instead, regulatory responsibilities are informally spread across the RBI (for monetary policy), the Ministry of Finance (for taxation), FIU-IND (for AML/CFT reporting), and SEBI (for potential classification as securities). This lack of a unified, purpose-built framework creates uncertainty for both users and developers, especially in areas like KYC enforcement, consumer protection, and cross-border remittance compliance.

The roundtable underscored that India is uniquely positioned to explore a regulated INR-backed stablecoin. With \$135.46 billion in remittances in FY 2024-25, the highest globally and over 85% smartphone penetration, India combines strong cross-border use cases with deep digital adoption. While 99.5% of youth use UPI, applying India's identity, payments, and data stacks, a well-designed stablecoin can improve remittance flows, support local-currency trade, and strengthen welfare delivery. Participants agreed that pilot projects and regulatory sandboxing should begin to test models aligned with India's public infrastructure.

III. IMPROVING CROSS-BORDER TRADE WITH BLOCKCHAIN

Beyond financial transactions, blockchain holds potential in digitising and streamlining trade documentation, a persistent bottleneck in cross-border trade. As global supply chains grow increasingly complex, inefficiencies in documentation, payments, customs clearance, and trust across jurisdictions hinder trade competitiveness, especially for small and medium enterprises (SMEs).

At present, over 40 documents are required to complete a typical cross-border shipment, with traders facing redundant data submissions, manual verification, and inconsistent standards across ports and customs¹¹. According to the WTO and World Bank, documentary compliance alone accounts for 25 to 30% of average trade transaction time in South Asia. Payments also remain fragmented and slow, routed through multiple intermediaries and correspondent banks, leading to high costs, especially in emerging market corridors.

Blockchain technologies can act as a shared, tamper-proof infrastructure to host trade documents, such as bills of lading, invoices, certificates of origin, and customs clearances, enabling faster, trustless verification across banks, logistics providers, and government agencies. In parallel, it can enable real-time cross-border payments through stablecoins or CBDCs, automate conditional settlements using smart contracts, and offer verifiable supply chain visibility for compliance and provenance.

A 2018 WTO report, *Can Blockchain Revolutionise International Trade?*, suggests that blockchain and related digital technologies could cut physical transportation expenses by up to 20% and significantly reduce compliance costs, which make up 25-30% of total trade transaction time in South Asia¹². For SMEs, these savings can be transformative, reducing barriers to export participation.

3.1. Key Opportunities for Blockchain in Cross-Border Trade

Participants identified the following forward-looking applications of blockchain that could simplify trade processes, enable faster payments, and enhance trust across jurisdictions.

➤ Document Digitisation and Real-Time Sharing

Trade documents issued and shared on-chain are instantly accessible to relevant parties,

¹¹ Sengupta, Nirmal, and Moana Bhagabati, with Rachna Ganatra. *A Study of Trade Facilitation Measures: From WTO Perspective*. Revised Interim Report. Chennai: Madras Institute of Development Studies, August 2003. Accessed September 26, 2025. <https://wtocentre.iift.ac.in/doc/study%20on%20trade%20facilitation.pdf>

¹² Ganne, Emmanuelle. *Can Blockchain Revolutionize International Trade?* Geneva: World Trade Organization, 2018. Accessed September 26, 2025. https://www.wto.org/english/res_e/booksp_e/blockchainrev18_e.pdf.

reducing the risk of fraud and administrative delays. Blockchain removes the need for repetitive data re-entry by providing a single source of truth.

➤ **Customs Automation and Risk-Based Clearance**

On-chain records enable customs authorities to pre-screen shipments, automate advance clearances, and streamline red-zone assessments, yielding significant time savings and reducing congestion at ports.

➤ **Automated Payments via Smart Contracts & Stablecoins**

Programmable trade flows can link delivery milestones with payment execution: smart contracts triggered by customs validation or logistics updates automatically release funds. Stablecoin or CBDC-based payment rails reduce currency conversion delays and costly intermediaries.

➤ **SME Empowerment and Payment Friction Reduction**

SMEs often struggle to secure trade finance or receive payments due to opaque documentation and low trust. Blockchain-based document trails and digital proofs can improve creditworthiness. In addition, programmable stablecoins can enable faster invoice payments and reduce FX conversion costs, particularly in bilateral corridors like India–UAE.

➤ **Improved Compliance and ESG Tracking**

On-chain registries can embed sustainability certifications, labour law compliance, or origin proofs, helping exporters meet evolving ESG and due diligence requirements from global buyers.

➤ **End-to-End Trade Automation**

By combining document validation, payment release, and logistics tracking into a single programmable workflow, blockchain can automate complex trade flows across jurisdictions, reducing delays and manual coordination.

3.2. Global Precedents in Blockchain-Enabled Trade Infrastructure

Several international initiatives offer early models for blockchain-enabled trade digitisation, demonstrating the feasibility of trusted, cross-border document and payment interoperability.

- **TradeTrust (Singapore):** Developed by the Infocomm Media Development Authority (IMDA) of Singapore, TradeTrust is a blockchain-based framework that enables the legal recognition of electronic trade documents across jurisdictions. The initiative facilitates document verification and title transfer, and has been piloted in corridors such as

Singapore-Australia and Singapore-UK.¹³

- **ICC TradeFlow (UAE-Singapore):** A bilateral trade corridor facilitated by the International Chamber of Commerce and powered by the blockchain platform Perlin. The initiative digitises invoices, customs declarations, and payment workflows while embedding smart contracts-enabled programmable trade flows.¹⁴
- **India:** India's Port Community System PCS-1X, a logistics standard platform rolled out across major ports, enables electronic invoicing and customs filings. While not blockchain-native, it provides a digital base upon which enhancements like blockchain-enabled document verification and smart-contract-mediated customs clearance are being tested at GIFT City through IFSCA-led sandbox initiatives and pilot token-based cross-border settlement programs.¹⁵

¹³ "TradeTrust: Overview." *Tech SG Developer*. <https://www.developer.tech.gov.sg/products/categories/blockchain/tradetrust/overview>.

¹⁴ International Chamber of Commerce. "ICC TradeFlow Blockchain Platform Launches to Simplify Trade Processes." November 7, 2019. <https://iccwbo.org/news-publications/news/icc-trade-flow-blockchain-platform-launches-to-simplify-trade-processes/>.

¹⁵ Press Information Bureau. "IFSCA Introduces Framework for Regulatory Sandbox to Tap into Innovative FinTech Solutions." Ministry of Finance, Government of India, October 19, 2020. <https://www.pib.gov.in/Pressreleaseshare.aspx?PRID=1665858>.

IV. SECURE DIGITAL PUBLIC REGISTRY ECOSYSTEM USING BLOCKCHAIN TECHNOLOGY

An important frontier in India's digital journey lies in the development of secure, interoperable public registries. From land titles and health records to MSME data and academic credentials, the integrity of these systems is foundational to trust in Digital India. A recurring theme in the roundtable was the use of blockchain technology to enhance this integrity. Participants underscored blockchain's potential to create immutable, transparent, and auditable land records, which could significantly improve citizen trust and administrative efficiency.

India's progress in this space has been fragmented. Land titling pilots in Karnataka, Andhra Pradesh, and Bihar have tested blockchain for registries, but most remain siloed or lack the foundational data integrity needed for scalable adoption. Roundtable participants emphasised that for blockchain to be effective, it must be built on accurate and reliable underlying records. It secures existing records, reinforcing the need for standardised, digitised, and verified registries as a precondition for on-chain applications.

4.1. Current Landscape and Policy Context

India's land administration continues to suffer from opaque, manual, and inconsistent record-keeping practices, causing disputes, delays, and corruption. In rural areas, land titles often date back to colonial-era documentation, with no centralised or digital proof of ownership. Urban land records are often encumbered by litigation, encroachments, or unclear leaseholds.

One of the speakers highlighted the importance of three legal principles foundational to effective land registry systems:

- **Mirror Principle:** The registry should accurately reflect real ownership and rights. It must clearly show the owner, nature of ownership, restrictions, and third-party interests.¹⁶
- **Curtain Principle:** The land record should be sufficient by itself, eliminating the need to look beyond the title to determine rightful ownership.¹⁷
- **Indemnity Principle:** The state should guarantee compensation for losses arising from errors in the land registry, ensuring accountability and trust.¹⁸

¹⁶ LawTeacher. "Mirror Principle and the Land Act." *LawTeacher.net*, February 2, 2018. [Mirror Principle and the Land Act | LawTeacher.net](https://www.lawteacher.net/land-act/mirror-principle-and-the-land-act.aspx)

¹⁷ Chen, James. "Torrens Certificate: Principles, Pros and Cons, Example." *Investopedia*, July 13, 2022. <https://www.investopedia.com/terms/t/torrens-certificate.asp>

¹⁸ Oxford University Press. "Torrens System." In *A Dictionary of Law*, 9th ed. Oxford University Press, 2015. <https://www.oxfordreference.com/display/10.1093/acref/9780198802525.001.0001/acref-9780198802525-e-4709#:~:text=Source:%20A%20Dictionary%20of%20Law,Writing%20and%20Citation%20Guide>

Failures in Indian pilots often stem from violations of the indemnity principle. Without state-backed indemnification, errors and disputes go unresolved, undermining citizen confidence.

To address this, the Government of India launched the Digital India Land Records Modernisation Programme (DILRMP), aimed at digitising textual and spatial land records¹⁹. As of 2024, over 90% of land records have been digitised in some form, yet interoperability and authentication remain major issues. Some key initiatives under this program and beyond include:

Initiative	Timeline	Scope / Scale	Core Technology	Key Objectives
Mission Bhu Suraksha	2023-24	Uttar Pradesh (rural parcels)	Drone & community mapping	Spatial validation of rural land records
NAKSHA- National Pilot	2025	152 ULBs across 26 states and 3 UTs	Drone & GIS; field audit	Urban parcel mapping, transparency, and planning
NAKSHA- UP Platform	2022-ongoing	UP municipalities	Satellite & ground survey	Reduce disputes, digitise urban property data
ULPIN / Bhu-Aadhaar	2021-2026	Estimated 28–29 states (pilot included)	Text & geo-coordinates	Unique land ID, unified database
NGDRS / e-Registration	2018-ongoing	28 states integrated, 18 live systems	Web-based, e-KYC, API integrations	One Nation One Software for registration
National Blockchain Framework (Vishvasya)	Sep 2024	National-level application stack	Blockchain-as-a-Service	Tamper-proof digital registry infrastructure

Despite these efforts, implementation challenges persist. Varying levels of progress across states, lack of real-time data integration, and low citizen awareness hinder systemic transformation.

¹⁹ Department of Land Resources, Ministry of Rural Development, Government of India. “Digital India Land Records Modernization Programme (DILRMP).” Last modified September 23, 2025. <https://dolr.gov.in/programmes-schemes/dilrmp-2/>

4.2. Global Precedents in Blockchain-Based Land Registries

Several countries offer real-world examples of how blockchain can improve transparency, efficiency, and trust in land administration systems:

- Georgia introduced a blockchain-based system in 2016, implemented by its National Agency of Public Registry (NAPR), to securely timestamp and register land titles. By 2018, over 1.5 million titles had been recorded on the chain, helping reduce processing times and improve public confidence in land records.²⁰
- Sweden's Lantmäteriet partnered with service providers to pilot blockchain in land transactions from 2016 onward. The initiative aimed to streamline property transfers through smart contracts, showing measurable reductions in time and paperwork in test environments.²¹
- Brazil piloted blockchain for land regularisation in vulnerable urban settlements, aiming to enhance transparency in low-income housing programmes. The initiative was facilitated in collaboration with UN agencies and state authorities.²²

These examples show how blockchain, when used with existing verification systems and data standards, can accelerate accuracy, efficiency, and trust in registries.

4.3. Enabling Technologies for Blockchain-Based Registry Ecosystem

Participants noted that blockchain adoption in land registries must be supported by complementary technologies to ensure accuracy:

- **Geospatial Mapping²³:** High-resolution satellite imagery, drone-based cadastral surveys, and GPS mapping can help create reliable spatial databases.
- **AI-based Verification:** Pattern recognition can detect anomalies in legacy records and help reconcile inconsistencies.
- **Digital Identity Integration:** Aadhaar-based authentication can ensure that property transactions are linked to verified individuals, reducing impersonation.

²⁰ Digital Impact and Governance Initiative. "Restoring Trust in Public Land Registries: Project Capsule-Republic of Georgia Land Titling System." *New America*, December 15, 2020. <https://www.newamerica.org/digital-impact-governance-initiative/blog/project-capsule-georgia-land-titling-system/>

²¹ "Land Registry in Sweden." *Blockchain for the People*, November 17, 2017. <https://blockchain.machetomag.com/sweden/land-registry-sweden/>

²² CoinGeek. "Land Registry Blockchain Testing Starts in Brazil." *CoinGeek*, April 7, 2017. <https://coingeek.com/land-registry-blockchain-testing-starts-brazil/>

²³ Team MyGov. "GIS Enabling Land Record Digitization in India." *MyGov Blog*, May 13, 2025. <https://blog.mygov.in/gis-enabling-land-record-digitization-in-india/>

- **UPI and Account Aggregator:** These DPI components can enable seamless, auditable payments and financial linkages during property transfers.

Urban areas, where land records are clearer, offer a safer testing ground for early blockchain registry pilots. Mortgaged properties, which are already verified by banks, can be onboarded first. Shared ledgers between banks and state land departments can accelerate verification and reduce encumbrance fraud.

4.4. Towards Tokenised Registries and Digital Asset Systems

Tokenisation refers to the digital representation of real-world rights or assets as programmable tokens on a blockchain. When linked to authenticated and legally valid registries, tokenisation can enable fractional ownership, enhance asset liquidity, and facilitate secure, 24/7 transfers. This paradigm shift holds significant implications for financial access, administrative efficiency, and the future of asset governance.

The roundtable discussed several high-impact tokenisation use cases:

- **Land Tokenisation:** Once land parcels are verified and linked to secure digital records, they can be tokenised to allow co-ownership, facilitate peer-to-peer transactions, or serve as collateral. This model can support new investment formats such as micro-investments or simplified Real Estate Investment Trusts (REITs), especially in underutilised or rural land markets.
- **Invoice Tokenisation for MSMEs:** MSMEs can issue verified, digitised invoices as tokens, which can be financed in near real-time. This approach supports faster working capital cycles and more efficient lender discovery. When integrated with systems like the Unified Lending Interface (ULI), it can improve access to credit without increasing risk.
- **Academic Certificate Tokenisation:** Karnataka has piloted blockchain-issued CBSE certificates that are cryptographically verifiable. If extended nationally, such systems can reduce credential fraud, improve portability across institutions and borders, and strengthen employment or admissions verification.
- **Municipal Bond Tokenisation:** Urban local bodies can explore tokenising bond issuances to enable retail investor participation, increase transparency, and reduce costs associated with intermediaries and issuance. This could support new models of public financing and civic participation.

Tokenisation built on robust and verified registries opens the door to more dynamic, efficient, and transparent management of assets and rights. While the foundational legal and regulatory frameworks will need to evolve in parallel, these use cases demonstrate clear paths for experimentation and scaled deployment. One participant noted that India could explore allowing non-Indian entities to invest in tokenised Indian government securities, potentially creating a new class of borderless, secure, and transparent financial instruments.

4.5. Challenges to the Adoption of Blockchain Technology in the Public Registry System in India

While blockchain presents clear opportunities for improving the integrity and efficiency of public registries, the roundtable surfaced a set of cross-cutting challenges that must be addressed to enable effective adoption. These span legal, institutional, and technical domains and reflect the complexity of integrating blockchain into existing governance structures. The key issues identified include:

- **Data Quality Gaps:** Participants highlighted that incomplete, inconsistent, or non-digitised legacy records remain a core barrier. Without reliable inputs, blockchain can end up preserving existing errors rather than correcting them. Ensuring data quality through prior digitisation and verification is essential for meaningful adoption.
- **Tax Treatment:** Under India's current tax regime for Virtual Digital Assets (VDAs), all gains from the transfer of VDAs are taxed at a flat 30% rate under Section 115BBH of the Income Tax Act, with no provision to deduct expenses or set off losses. Additionally, a 1% Tax Deducted at Source (TDS) applies on transfer transactions under Section 194S²⁴. This framework does not differentiate between speculative crypto assets and utility tokens, creating regulatory friction for non-speculative, public-good use cases such as registry access or notarisation tokens..
- **Regulatory Uncertainty:** There is currently no comprehensive framework governing blockchain-based registries or asset tokens in India. Oversight remains fragmented across RBI, SEBI, and various state departments, depending on the asset class and use case. This creates legal and operational uncertainty for builders and investors.

A senior policymaker at the roundtable remarked that India's digital economy has historically benefited from a permissive and innovation-first regulatory approach. Overregulation, such as prematurely applying full securities or financial compliance burdens, could stifle experimentation and restrict open innovation.

²⁴ Surana, Ektha. "Taxation on Cryptocurrency: Guide to Crypto Taxes in India 2025." *ClearTax*, September 4, 2025. <https://cleartax.in/s/cryptocurrency-taxation-guide>

The early internet, UPI, and even AI ecosystems thrived in India partly because regulation followed innovation, not the other way around. Taking a similar approach to tokenisation and blockchain-based registries, by enabling pilots, building sandboxes, and allowing ecosystems to mature before hard law, is critical to unlocking their potential.

- **Preconditions for Effective Blockchain Integration:** Effective adoption of blockchain in land and property registries hinges on a robust technological ecosystem that ensures the reliability of data entering the chain. Participants noted that blockchain alone cannot guarantee accuracy or resolve legacy inconsistencies; it must be supported by complementary technologies and infrastructure.

Geospatial tools such as drone-based cadastral surveys, high-resolution satellite imagery, and GPS mapping are critical to building verifiable spatial records. States like Maharashtra and Karnataka are already leveraging drone surveys under the SVAMITVA scheme to improve land mapping²⁵. Similarly, AI-powered anomaly detection can help clean legacy records and flag inconsistencies across fragmented databases. Although essential for building trustworthy registries, these technologies are yet to see systemic adoption, with current efforts largely restricted to isolated pilots and proofs of concept.

- **Talent Flight Risk:** While India has a strong base of engineering and entrepreneurial talent, participants noted that regulatory ambiguity and punitive tax treatment are prompting many blockchain entrepreneurs to relocate abroad. One participant referred to this trend as the “DDS syndrome,” reflecting a growing shift of builders to Dubai, Dublin, and Singapore. Without a clear policy roadmap, India risks missing a strategic opportunity to lead in public-sector blockchain innovation.

The roundtable recognised that blockchain technology can serve as a strong foundational layer for improving registry systems in India. Its ability to offer trust, traceability, and transparency depends on the quality of underlying data, specifically, whether it is verified, digitised, and interoperable. India’s progress through initiatives like DILRMP, ULPIN, NGDRS, and recent pilots such as Mission Bhu Suraksha and NAKSHA positions it well to take the next step. Blockchain can strengthen the integrity and utility of public records, while tokenisation may eventually enable broader access to credit and unlock the economic value of public assets.

To translate India’s blockchain potential into scalable outcomes, the roundtable emphasised the need for a shared governance and design framework that could support secure, interoperable, and modular public registries. Fragmented implementations and legacy data silos continue to limit the impact of digital transformation efforts. In this context, SUTRA (Shared and Unified Trust

²⁵ Ministry of Panchayati Raj, Government of India. *SVAMITVA Scheme*. <https://svamitva.nic.in/>

Registry Architecture) was introduced as a forward-looking multi-stakeholder initiative to guide the next generation of trust-based registries. By offering a common blueprint that balances legal compliance, institutional autonomy, and technical interoperability, SUTRA enables different sectors and states to build connected, verifiable systems without reinventing the wheel.

V. SUTRA: A FRAMEWORK FOR TRUST-BASED REGISTRIES

Across governance, welfare, and market systems, registries serve as the foundational layer of trust. They record ownership, eligibility, identity, institutional history, and service entitlements. As India's digital infrastructure deepens, the value and fragility of registry systems have become increasingly evident. Many remain fragmented, semantically inconsistent, or difficult to verify, leading to exclusion, inefficiency, and limited adaptability.

SUTRA (Shared and Unified Trust with Registry Architecture) consortium is a collective initiative designed to address these challenges. It is not a platform or portal, but a multi-stakeholder group consisting of public institutions, technical experts, civil society actors, startups, and infrastructure providers focused on the design, linkage, and governance of registries and associated technologies that are modular, verifiable, and interoperable. The group aims to provide principled frameworks, technical patterns, and institutional setup to support both near-term welfare delivery and longer-term emerging technologies, including decentralised identifiers, tokenised entitlements, and machine-verifiable attestations.

SUTRA is grounded in five core principles, applicable across domains and institutional contexts:

- **Verifiability:** Registries must enable trusted, transparent, and non-redundant verification without requiring duplication of data.
- **Interoperability:** Registries should be capable of structured interaction across departments, platforms, and jurisdictions.
- **Modularity:** Components and schemes should be updatable, reusable, and minimally dependent on fixed legacy systems.
- **Local Context:** The legal, social, and semantic logic of each domain must be preserved, even when infrastructure is standardised.
- **Extensibility:** Registries should be adaptable to support emerging needs, such as decentralised record attestation, privacy-preserving updates, or machine-readable credentials.

SUTRA could help India leapfrog into a global leadership position in verifiable registries and DPI innovation. It provides a blueprint to align technical, legal, and governance dimensions across sectors.

Recognising that the strength of SUTRA lies in its collaborative ethos, stakeholders across government departments, technology providers, legal experts, civil society actors, and multilateral institutions are warmly invited to engage with this effort. Their contributions, whether through technical co-development, domain-specific feedback, or policy alignment, will be instrumental in

shaping SUTRA into a shared public good that reflects India's digital aspirations while setting new benchmarks for trust infrastructure globally.



VI. RECOMMENDATIONS

Use Cases	Recommendations
Responsible INR-Backed Stablecoin Framework	<ul style="list-style-type: none"> ➤ Clear Rules for Issuance Authority and Governance Models The government should clearly define whether INR stablecoins can be issued only by the central bank or through a regulated framework for licensed entities, including banks and payment operators, under appropriate prudential norms and consumer safeguards. ➤ Robust Reserve Management and Audit Mechanisms Stablecoins must be backed by INR-denominated reserves in a 1:1 ratio, held in segregated accounts with regulated banks. Regular third-party audits and public disclosures should be mandated to ensure reserve integrity and mitigate risks of mismanagement or insolvency. ➤ DPI Integration Aadhaar-based eKYC, Account Aggregator access, and UPI rails should be leveraged to make compliance and transaction monitoring frictionless and India-specific. ➤ Progressive Taxation Regime A differentiated tax treatment for regulated stablecoins can encourage use in real-economy transactions (e.g., trade settlement, remittances) while maintaining financial transparency as opposed to India's current flat 30% tax and 1% TDS regime, which applies uniformly across all virtual digital assets, disincentivising productive and compliant use cases alongside speculative trading. ➤ Pilot Programs and Sandboxing Participants emphasized the need to initiate regulatory sandbox pilots for INR-backed stablecoins in India, under the oversight of the RBI or IFSCA. Controlled pilots can help test interoperability with DPI rails like UPI, study reserve management models, and evaluate AML/KYC compliance in real-world conditions, laying the groundwork for a robust, India-specific regulatory framework.

Cross-Border Trade Facilitation	<ul style="list-style-type: none"> ➤ Enable Tokenisation of Trade Asset: Tokenising trade documents, assets, and contracts can streamline cross-border workflows. Introducing pilots that allow tokenised representations of invoices, letters of credit, and bills of lading can enable programmable compliance and faster settlement. ➤ Promote Smart Contract-Based Credit Mechanisms: Encouraging sandboxed pilots for programmable trade credit using smart contracts, especially for MSMEs and export corridors, would reduce delays and cost overruns by automating conditions in trade finance. ➤ Clarify Legal Status of Digital Instruments: Establish regulatory certainty around tokenised contracts and digital trade documents. ➤ Integrate with National Platforms: Align blockchain pilots with ICEGATE, PCS 1x, and other trade facilitation.
Blockchain-Based Public Registry System	<ul style="list-style-type: none"> ➤ Layered Implementation: Start with urban areas and verified properties, then expand to rural registries. ➤ Regulatory Sandboxes: Allow controlled pilots for blockchain registries and asset tokenisation, under oversight from land and revenue departments of respective states and local governments. ➤ Clear Legal Definitions: Define land tokens, utility tokens, and credential tokens distinctly to separate them from speculative crypto. ➤ Indemnity Framework: Establish mechanisms for error resolution and compensation to build citizen trust.



Digital India Foundation,
G46, Sector-3, Noida,
Uttar Pradesh 201301, India