



Article

Digital Identity, Documentation, and Citizenship Governance: A Techno-Legal Assessment of Vulnerability Under the CAA and NRC in India

Article History:

Name of Author:

Dr. Prachi Mishra

Affiliation:

Assistant Professor of Law, UPES Dehradun, Uttarakhand, India.

Corresponding Author:

Dr. Prachi Mishra

How to cite this article:

Mishra P *et. al.* Digital Identity, Documentation, and Citizenship Governance: A Techno-Legal Assessment of Vulnerability Under the CAA and NRC in India. *J Int Commer Law Technol.* 2025;6(1):1444–1452.

Received: 27-10-2025

Revised: 18-11-2025

Accepted: 01-12-2025

Published: 07-12-2025

©2025 the Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>)

Abstract: India's citizenship laws have seen massive changes brought forth by The Citizenship Amendment Act (CAA) and National Register of Citizens (NRC). These changes have significantly created a state of uneasiness and unrest among certain sections of the society such as, women, children, elderly and the disabled, exposing them to significant vulnerabilities mainly due to the lack of trust in the manual documentation. The authors aim to highlight the importance of a robust digital infrastructure, thereby advocating the intersection of technology and law, which can prove to be a boon for safeguarding the rights of the vulnerable communities. The paper focuses on addressing the urgent need responsible for the furore and unrest among vulnerable groups created by CAA and NRC. The traditional methods of documentation have resulted in widespread legal uncertainty and marginalization, thus proving to be an inadequate method and leading to an adverse impact on the vulnerable sections with no fault of them. This paper critically examines the highlighted gaps and how they can be bridged using the digital solutions, thereby showcasing a transformative potential of the modern technology and giving a techno-legal angle to the solutions of the issues highlighted. Through this paper the authors aim to foster an inclusive and equitable society by solving the complex legal challenges through technology driven methods.

Keywords— Digital Identity, Citizenship (Amendment) Act 2019, NRC, Digital Documentation, Blockchain Technology, Vulnerable sections.

INTRODUCTION

India's citizenship system has undergone a new layer of complexity with the introduction of the Citizenship Amendment Act (CAA) of 2019 and National Register of Citizens (NRC). Although the intention stated behind CAA and NRC was the streamlining of process of citizenship, however, the implementation of the same led to the exposition of ingrained inequalities, thereby impacting the vulnerable groups namely women, children, elderly and economically disadvantaged individuals. This inequality further aggravated and had put millions of people at risk due to their complete dependency on the traditional documentation system which have been inefficient, and prone to errors and biases. These traditional systems have majorly failed because of their rigid

expectations of preserving the necessary documents especially the marginalised individuals who are residing in rural areas or have been uprooted out of their homes because of disasters, with their own life at risk. In addition to this, circumstances like illiteracy, migration or displacement make it nearly impossible for these vulnerable groups to provide ancestral or legal documents. This has affected the vulnerable sections who then become the victims of inequality, and socio-legal marginalization. This dependency on physical documentation not only marginalizes these groups but also increases their susceptibility to bureaucratic inefficiencies, corruption, and legal disputes.

Despite the initiatives like Digital India and global emphasis on E-Governance, India's reliance on

manual methods of documentation have led to hurdles for equitable citizenship determination, as the traditional system fails to incorporate modern technological advancements having capability of building more efficient, transparent and inclusive solutions.

The paper aims to discuss the inequalities and vulnerabilities associated with CAA and NRC along with the challenges of the manual documentation process and highlight digital documentation systems as an alternative to traditional methods of citizenship determination. Additionally, given the rapid pace of technological advancement, the paper also would explore the avenues of emerging technologies such as blockchain and digital ID systems that can prove to be a boon by creating a secure, transparent and inclusive citizenship documentation and ensuring data integrity and accessibility while reducing the risks of exclusion and manipulation.

Lastly, the paper would propose a techno-legal framework with an aim to integrate the technological tools with necessary legal reforms. This would prove to be tripartite solution for the associated challenges of the existing system, namely, safeguarding the rights of vulnerable groups, addressing the gaps in the existing systems and ensuring a fair and equitable approach to citizenship documentation.

CITIZENSHIP DOCUMENTATION: HISTORICAL AND SOCIO-LEGAL PERSPECTIVES

Historical Challenges in Citizenship Documentation

Indian citizenship determination system can be traced back to the colonial times where for governance and control, paper-based records were highly relied on. This manual documentation system eventually became the backbone of the identification of individuals consisting of birth certificates, property deeds, voter IDs, and ration cards. However, this largely impacted the marginalized communities as the system was inherently exclusionary disproportionate. For instance, women particularly in patriarchal societies and rural populations faced lack of access to registration facilities and limited agency for establishing independent legal identities. This lack of independent legal identities for women led to massive gender disparities. Additionally, it was even more difficult to preserve records and documents across generations for refugees, displaced populations and people affected by natural disasters.

Post CAA and NRC Implementation

The challenges arising due to complete reliance on manual documentation for citizenship determination came in limelight because of the introduction of CAA and NRC. The requirement of providing legacy documents to prove one's lineage and residence under CAA and NRC highlighted all the persisting issues since colonial era. The marginalised and

vulnerable communities who were already struggling due to lack of basic legal recognition, and access to major facilities, now were also dealing with the fear of statelessness due to their inability to secure and produce the necessary records.

The NRC implementation in Assam is one of those many cases where around 19 lakh individuals were excluded from the final citizenship list, majorly due to lack of birth certificates and/or ancestral documents. A highly decorated retired Indian Army officer, Mohammad Sanaullah who was declared a foreigner despite his unconditional service to the country highlights the failure of the system highly relying on the physical documentation. These scenarios are a wake-up call for an alternative method of citizenship verification.

Legal, Bureaucratic and Social Implications of Manual Documentation

The traditional documentation system for citizenship determination is not only impractical and error prone but is also deeply ingrained in the bureaucratic inefficiencies. The existing system works on the verification system which consists of multiple levels of scrutiny, thereby leading to delays, corruption and legal disputes. This largely impacts the vulnerable sections of the society who have limited access to legal aid. For instance, in order to determine your citizenship, one has to provide multiple supporting documents, such as land records, voter ID, ration cards, etc. which can be overwhelming for many groups of individuals especially the economical and disadvantaged groups. Additionally, over reliance on the already overburdened government officials along with the lack of transparent decision-making system further erodes the trust in the existing system.

The disadvantaged groups who have already been struggling to get a basic legal status now struggles with the series of documentation, which if they fail would lead to exclusion of citizenship that goes beyond legal status. The consequence of statelessness leads to denial of access to basic rights, for instance education, healthcare, employment, etc. These consequences of statelessness have also created a fear of social exclusion among the marginalized groups leading to psychological distress. Among the vulnerable groups, the group more susceptible to exclusion and making them more vulnerable are women, as their identities are usually tied to the male relatives in the patriarchal set up.

Therefore, the existing system and the procedure of identification is capable of denying legal recognition to the entire community, thereby marginalising the individual and creating social inequality. This cycle of exclusion undermines the principles of equality and justice enshrined in the Indian Constitution thereby creating the need to address the challenges of the existing Indian Citizenship system and a paradigm shift from traditional system of documentation to

digital framework.

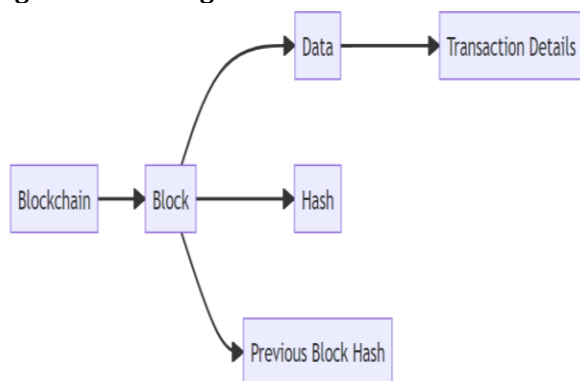
DIGITAL DOCUMENTATION: OPPORTUNITIES AND RISKS

The advancement of technologies and adoption of the same in different sectors have greatly increased the efficiency of many tasks. The idea of digital documentation in the context of citizenship verification showcases a transformative shift from manual, and error prone system to secure, efficient and inclusive digital system. This shift would entail the adoption of emerging technologies such as blockchain and digital ID systems having capability to address the lacunas of the existing system. However, while the adoption of these technologies might help vulnerable groups prove their citizenship and retain their legal status, its implementation must be done very cautiously by balancing the innovation and ethical consideration such as privacy, accountability, accessibility and systemic vulnerabilities.

Blockchain Technology: A Revolutionary Approach

Blockchain is a distributed and decentralised digital ledger that records the transactions and data across multiple blocks. Each block is connected to the one before and behind it containing a cryptographic hash function. This system ensures transparency, security and immutability, thereby reducing the risk of data breaches, unauthorised changes, and data tampering - making it suitable to store critical information and data.

Figure 1: Working of Blockchain



With blockchain technology handling and recording the citizenship data, the chances of data being altered and deleted is negligible. This immutability characteristics provides a shield to the individuals against fraudulent and arbitrary changes in their legal status, which is possible in manual systems. The errors that resulted over 19lakhs individuals from Assam's NRC list would have been prevented via blockchain based citizenship records. Additionally, the data stored on blockchain network guarantees transparency, since any changes made thereon are traceable. This reduces the scope of corruption and exclusionary practices, thereby creating a sense of

trust in the system. Moreover, the government servers are mostly centralised and hence are susceptible to hacking and data loss, on the contrary the blockchain based system are decentralized, storing data in multiple blocks. This helps mostly in disasters prone areas where it is nearly impossible to maintain or save the physical records. Lastly the blockchain

Apart from the characteristics that makes blockchain system suitable for citizenship documentation, there are few instances as well that portrays the success of governance system when integrated with blockchain. In Estonia over 1 million records were secured on blockchain system that included identity and healthcare data, which as a result reduced administrative inefficiencies and increased the trust of the citizens. Additionally, in Rwanda land ownership were recorded on a blockchain system which created a secured and transparent system resulting in reduced land disputes and corruption. Digital ID Systems: Enhancing Accessibility and Efficiency

Digital ID systems use biometric identifiers such as fingerprints, facial recognition, or retinal scans to establish a person's identity. A secured database is used to store these identifiers and is then linked to demography and legal data of the individual, which enables the citizens to verify their identity anywhere and anytime, thereby making it a reliable alternative to traditional documents.

The challenges of manual documentation especially for vulnerable populations in case of citizenship data can be addressed through Digital ID systems. Those individuals who have lost their documentation or are not able to access them due to displacement, lack of facility or calamities can prove their citizenship via biometric authentication. These Digital IDs for each of the citizens can be accessed remotely without any need of physical documents or dependency on government offices. Since the identifiers used in Digital IDs are unique for every individual, it mitigates the possibility of identity theft or forgery. These Digital IDs can further be integrated to several services such as healthcare, education, welfare programs, etc., thereby ensuring that basic rights are easily available to all citizens.

One of the notable examples of the transformative potential of digital ID system is India's Aadhar System, which is considered as the world's largest biometric identification system covering over 1.3 million individuals. Aadhaar exemplifies the scalability and integration capabilities of digital ID systems, offering insights into managing large-scale populations while maintaining functionality.

Although Digital ID systems possess significant potential in integrating large amount of individual data, but it also presents significant challenges that needs to be addressed cautiously. Data Privacy breach is one of the significant concerns related to

digital ID system. Since Digital ID system is a centralized system of sensitive data, therefore it becomes very susceptible to privacy risks, unauthorised access and tampering. In addition to this, digital ID system requires technological literacy and infrastructure, which are very limited in rural areas. This limitation gives rise to digital divide and hence creates inequalities in accessing services. In order to ensure that digital ID systems are secure and equitable, it is required that these issues are addressed soon.

THE INDIAN LEGAL FRAMEWORK AND LESSONS FROM GLOBAL PRACTICES

Indian Legal Framework

As we explore the implementation of digital documentation for citizenship verification, it is pertinent to discuss the existing legal framework and also to assess the best practices from countries who have adopted emerging technologies in their governance.

India's legal framework specifically citizenship laws are deeply ingrained in the manual traditional documentation system. The foundation for citizenship laws has been established by Indian Constitution (Article 5-11) which defines citizenship at the commencement of the Constitution dealing with domicile, migration and nationality and The Citizenship Act, 1955 which deals with citizenship post the commencement of the constitution and details acquiring of citizenship through birth, descent, registration, naturalisation and incorporation of territory. Both legal landscapes completely rely on paper-based documentation for their birth certificates, land records etc. for the determination of citizenship and eliminates or excludes the individuals who cannot provide these records. As a result, the vulnerable sections displaced due to poverty, disasters or socio-economic factors face the systemic barriers. The Citizenship Amendment Act, 2019 and National Register for Citizens has further aggravated these challenges

India's legal framework regarding Blockchain technology and Digital ID system is inadequate. As of now we have Information Technology Act 2000 which recognises the electronic records and transaction but does not include blockchain decentralised system and blockchain based legal records limiting its applicability in Citizenship verification. Additionally, Digital Personal Data Protection Act 2023 although provides privacy safeguards but fails to include blockchain related challenges, such as, conflict between immutability and right to be forgotten, implication of decentralised storage mechanism for data ownership and many more. Similarly, Aadhar Act 2016 curated for India's Digital ID system but is not adequate for citizenship verification.

There exist huge legal gaps in the existing legal frameworks in India which requires comprehensive reforms for transitioning from exclusionary manual systems to secure and inclusive digital documentation frameworks.

Global Practices: Lessons for India

Countries such as Estonia, Kenya and Rwanda have leveraged technology to overcome the governance challenges thereby highlighting the potential of digital documentation systems.

The e-governance model in Estonia is a benchmark at global level. It is the result of integration of blockchain technology with digital ID systems for a smooth communication between citizens and state. Estonia's Keyless Signature Infrastructure ensures traceability and integrity by securing the public records. Through the digital ID system in this model, the public can access the government services securely and the legal recognition of digital records and electronic signatures has further helped Estonia to establish a robust framework for digital governance. Although the population of Estonia is smaller than Indian population, India can still learn from Estonia's interoperable framework and emphasis on digital literacy. Additionally, the principles of secured data, its management and citizen centric delivery system can greatly help India in its transition to digital documentation. For adopting an approach similar to Estonia, amendment in digital laws is required in order to validate the blockchain based records and campaigns on digital liter

The blockchain based land registry in Rwanda further highlights the potential of emerging technologies in addressing the challenges of digital documentation in resource constrained environment. This land registry system of Rwanda ensures integrity of the public records thereby mitigating the risks of fraud and corruption. Taking lessons from Rwanda's model India can leverage blockchain's transparency and security and establish a decentralized and immutable citizenship record, this could reduce the risks of exclusion and manipulation.

Huduma Namba, an initiative in Kenya which aims to integrate biometric data with the government services via centralised digital ID system. However, this initiative has faced a lot of backlashes due to its overcentralised and privacy concerns. These challenges mirror the issues faced by India with the Aadhar system and highlights the risks of solely relying on a centralised system. Taking lessons from Kenya's challenges India can implement a hybrid model instead of solely relying on a centralised system. This Hybrid model can integrate Aadhar with blockchain technology thereby ensuring transparency, data security, reliability and resilience. India to transition to digital documentation needs to adapt and learn from the global practices and strengthen its legal framework for recognition of

digital procedures and building the trust of the people on the digital system. Additionally, the existing system of Aadhar if integrated with blockchain system can prove to be very effective in terms of citizen-government relations.

PROPOSED TECHNO-LEGAL FRAMEWORK: INCLUSIVE DIGITAL CITIZENSHIP SYSTEM

The existing Indian Citizenship verification system is riddled with inequalities and vulnerabilities and hence require major transition to ensure inclusivity, security and transparency. This section of the paper proposes the solution in the form of a multifaceted system that mitigates most of the challenges faced in the India's citizenship documentation under CAA and NRC and even prior to them. This model is a techno-legal framework- Inclusive Digital Citizenship System (IDCS) that would combine blockchain technology, digital ID system and community-based support, ensuring that no citizens are left behind and address the challenges of traditional documentation. This framework not only aims to streamline the documentation and verification process but also ensures that the marginalised groups are protected, and the sensitive data is used ethically.

Objectives of proposed Inclusive Digital Citizenship System

IDCS aims to address the challenges of the traditional documentation system along with establishing trust of the citizens on digital governance. The main aim of this framework is to create a system that have a potential to deal with the socio-economic realities of India. The framework further puts two agendas at its core: Firstly, to ensure that the principle of inclusivity, i.e. to ensure that the vulnerable population and the economically disadvantaged group who do not possess the independent documentation due to displacement, or their sole dependence on the relatives, are brought within the ambit of the legal citizenship. Secondly, IDCS also highlights the issue of data security and provides a robust system with advanced encryption and decentralisation via blockchain technology thereby mitigating the risks of tampering with the record and data breaches.

Additionally, the framework also aims to reduce the administrative burden by introducing automation and digitization. With the help of smart contracts and digital IDs the ancestral verification system could be streamlined, thereby replacing the paper-based system in which it becomes hard to find certain records especially records which are ancient.

Components of IDCS

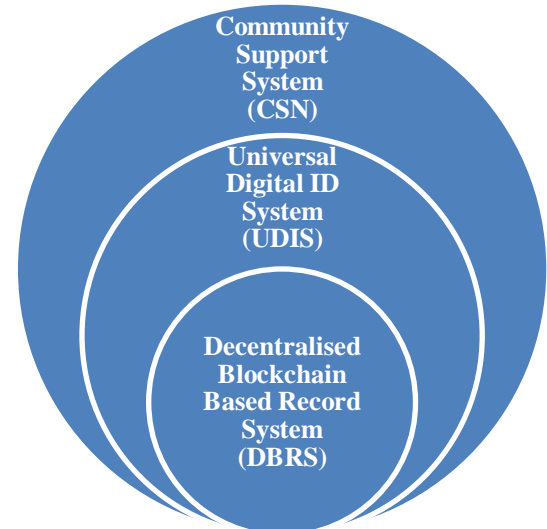


Figure 2: Inclusive Digital Citizenship System (IDCS)

Decentralized Blockchain-Based Citizenship System (DBRS)

DBRS is a tamper proof and decentralized solution for citizenship documentation and verification process which forms the backbone of this system. The traditional centralised documentation systems as discussed are prone to errors, manipulations and data breaches, but DBRS provides a decentralised framework in which data is stored in different blocks ensuring transparency and security. At the core of the DBRS is its ability to create immutable digital records for each citizen. Citizenship data, including legacy documents, biometric information, and residency proofs, would be digitized and uploaded to the blockchain after verification by authorized government entities. Each entry is cryptographically secured, making it nearly impossible to alter or tamper with records once added. This addresses the pervasive issue of fraudulent documentation that has plagued India's citizenship processes.

The blockchain's smart contract functionality further enhances its utility. Smart contracts can automate processes such as verifying lineage and validating residency claims. For instance, when a citizen submits a residency application, predefined legal parameters encoded into the smart contract can automatically verify supporting documents against blockchain records, reducing human intervention and administrative delays.

Despite its advantages, implementing the DBRS at a national scale comes with challenges. The sheer size of India's population requires a highly scalable blockchain infrastructure capable of handling billions of transactions. Transitioning from energy-intensive consensus mechanisms like proof-of-work to sustainable alternatives such as proof-of-stake is essential to ensure environmental sustainability. Moreover, legal recognition of blockchain records is

critical, necessitating amendments to the *Bhartiya SakshyaAdhiniyam 2023* to validate these digital records in court proceedings and administrative reviews.

Universal Digital ID System (UDIS)

UDIS highlights a decentralised data ownership and interoperability, thereby showcasing a transformative approach to identification management. India's current Aadhar system is centralised system with biometric data in a single repository, UDIS on the other hand stores data in different secured nodes which would ensure that the data owners retain the control over their sensitive personal data.

UDIS functions by linking the biometric data (fingerprints, facial recognition, retinal scans, etc.) of citizens to a unique digital ID. This ID serves as a gateway to accessing a host of services, including citizenship verification, welfare benefits, and government schemes. Unlike traditional IDs tied to physical documents, the UDIS allows citizens to manage and update their data autonomously, granting or revoking access to entities as needed.

Privacy safeguards are at the heart of the UDIS. Biometric data is encrypted and stored separately from demographic information to minimize risks associated with unauthorized access. Advanced anonymization techniques ensure that personally identifiable information is not exposed during data-sharing processes. For instance, when a government agency needs to verify a citizen's identity, the UDIS shares only the required data points without exposing the entire dataset.

Interoperability is a key feature of the UDIS, enabling seamless integration with other government and private-sector platforms. This ensures that citizens can access multiple services through a single ID, eliminating the need for redundant documentation. For marginalized groups, particularly those lacking ancestral records, the UDIS provides a lifeline by validating identity through biometric authentication rather than paper-based proofs.

Community Support Network (CSN)

Recognizing India's significant digital divide, the Community Support Network (CSN) is an essential component of the framework, ensuring accessibility and inclusivity. The CSN addresses the technological and infrastructural barriers faced by rural and underserved populations by offering on-ground support through local assistance centers.

The CSN plays a dual role in bridging the gap between technology and citizens. First, it organizes digital literacy programs to educate individuals, particularly in rural areas, about the benefits and usage of the digital system. These programs emphasize practical skills such as creating digital

profiles, accessing records, and resolving disputes. Second, the network establishes local assistance centers equipped with internet access and trained personnel to help citizens who lack the resources or skills to engage with the digital platform independently.

Grievance redressal is another critical function of the CSN. Disputes arising from incorrect data entry or exclusions can be addressed through dedicated channels, ensuring no citizen is unfairly denied their rights. For women, the elderly, and differently abled individuals, the CSN provides tailored assistance, ensuring that systemic barriers are minimized.

Legal and Policy Reforms

The proposed framework cannot function without substantial legal reforms. Current laws such as the *Citizenship Act (1955)*, *Bhartiya SakshyaAdhiniyam (2023)*, and *DPDP Act (2023)* lack provisions for recognizing digital records and decentralized storage systems. Amendments to these laws must establish blockchain-stored data as valid evidence and incorporate protections for biometric and demographic data. Moreover, the establishment of a decentralized blockchain-based record system (DBRS) and Universal digital ID system (UDIS) requires the introduction of dedicated policies to govern their implementation and operation. These policies must address key issues such as transparency, accountability, data governance, and public participation.

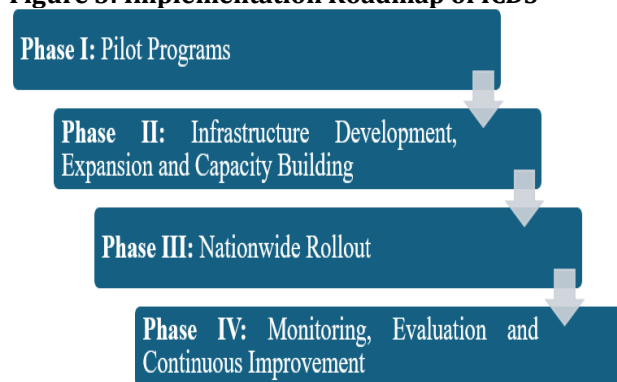
New policies should require full transparency in the design and operation of DBRS and UDIS. This includes public disclosure of system, data-sharing agreements, and decision-making processes. Accountability mechanisms, such as regular audits and public reporting, must be established to ensure compliance with ethical and legal standards.

Implementation Process

The implementation of ICDS must be done in phases to ensure scalability and adaptability. The states which have well developed or advanced digital system can be the starting point, from where challenges can be observed, and the framework can be further refined. Simultaneously, the rural areas and other areas with poor digital infrastructure should be developed in order to expand the internet connectivity and also establish local helpdesks.

At the stage of nationwide implementation, public awareness campaigns on digital literacy and educating the public about the functioning of ICDS should be conducted. Additionally, for outreach purpose especially for vulnerable populations, partnerships with the NGOs can be beneficial. In order to assess the ICDS performance and refine the same, regular audits and citizen feedback mechanism will be essential.

Figure 3: Implementation Roadmap of ICDS



Phase I: Pilot Programs

To test the feasibility and efficiency of ICDS, the first phase of this proposed framework involves the launch of pilot programs in those areas which have digital infrastructure or are digitally advanced and relatively low population densities. The main aim of this pilot program will be to test the scalability of Decentralized Blockchain based record system (DBRS) and Universal Digital ID Systems (UDIS), analysing the integration of blockchain with the government services along with identifying the potential legal, and technological challenges. In addition to this, the implementation of pilot programs will also involve the feedback collection from all the users, government officials and technical experts in order to further improve the framework.

Figure 4: Implementation steps of Pilot Project (Phase I)



Phase II: Infrastructure Development, Expansion and Capacity Building

Post success of Phase I Pilot Project, the Phase II will start with scaling the framework to national level which will include development and expansion of digital infrastructure along with capacity enhancements of stakeholders. The expansion of digital infrastructure especially in rural and remote areas will include enhancing and establishing internet connectivity, additional blockchain nodes and data centres and user-friendly platforms for easy access to digital citizenship records.

Additionally, capacity building initiative will be taken up by providing extensive training to government officials, and technical experts along with educating local community leaders so that they can act as a bridge between the citizens and digital system.

Phase III: Nationwide Rollout

This phase includes the implementation of ICDS framework across the states and union territories. The implementation strategy will work by prioritizing the urban and digitally advanced areas to gain momentum and refine the process, followed by the implementation in rural areas with additional support in terms of infrastructure and literacy challenges. The DBRS and UDIS integration with the government services will ensure interoperability and mitigate duplicate efforts.

Additionally, campaign in all the state and union territories will be conducted to educate the citizens about the framework's benefits and address their concerns resulting in ensuring public acceptance and trust.

Phase IV: Monitoring, Evaluation and Continuous Improvement

In this last phase, the performance of the framework will be monitored, the impact will be analysed, and continuous improvements will be done to address the potential challenges and opportunities.

In order to monitor the performance of the framework a centralised dashboard will be developed which will track the key performance indicators (KPIs). Additionally, regular auditing by the independent agencies will ensure the compliance with legal and ethical standards.

The evaluation of the frameworks' impact on inclusivity, efficiency and transparency will be done based on three main metrics:

1. Reduction in exclusion rates of the vulnerable populations
2. Reduction in time and cost in citizenship verification process
3. Surveys and Feedback indicating public trust on the system.

On the basis of the performance monitoring and impact assessment, the framework will be further refined and developed to address the existing challenges and accommodate the future technological advancements.

CONCLUSION

The governance journey of India is at a crucial stage where technological advancements are providing opportunities that can be leveraged in redefining the verification and documentation system of the citizenship. This paper presents a transformative solution to the long-standing issue of citizenship verification in India in the form of proposed techno-legal framework. This framework provides a secure, inclusive and transparent solution to the inefficiencies of the traditional documentation methods via integration of blockchain technology, digital ID systems and community driven support mechanism. This framework if adopted will not only

help in inclusion the marginalised group but will also set precedent for the utilising emerging technologies to safeguard fundamental rights and social equity. ICDS is not only a technological innovation but also acts a trust building bridge between the citizen and state.

Legal reform emerges as the cornerstone of the transformation. To effectively implement this framework, India's regulatory framework must evolve by accommodating and recognising the technological advancements and complexities along with stringent data protection mechanisms in safeguarding citizenship information. Additionally, the phased implementation roadmap highlights the practicality of this ambitious vision, ensuring that the benefit of this framework reaches to every citizen regardless of geographical and socio-economic barriers.

ICDS is not just a solution to the traditional citizenship documentation inefficiencies but is also a reflection of commitment to revamping the governance system in accordance with the diverse population and their needs. This framework envisions a future where technology can be used as a tool for empowerment and justice and proves that technology if used in the right direction can prove to be a boon to the society. For India, this framework can be an opportunity to lead in the global community by an example showcasing the potential of technology in upholding human dignity and democratic values.

References

1. Hausman G, 'Citizenship Amendment Act (CAA) and National Register of Citizens (NRC)' (Global Studies Blog, 10 December 2020) <https://blogs.cul.columbia.edu/global-studies/2020/12/10/citizenship-amendment-act-caa-and-national-register-of-citizens-nrc/> accessed 20 September 2024
2. Shamsan Saleh AM, 'Blockchain for secure and decentralized artificial intelligence in cybersecurity: A comprehensive review' [2024] Blockchain: Research and Applications 100193 <http://dx.doi.org/10.1016/j.bcr.2024.100193> accessed 29 September 2024
3. McClune S, '8 Countries With The Most Innovative Digital ID Systems' (Beyond Encryption - Home Of Maillock, Nigel, &AssureScore, 3 November 2023) www.beyondencryption.com/blog/countries-most-innovative-digital-id-systems accessed 29 September 2024
4. 'The National Register of Citizens and India's commitment deficit to international law' (LSE Human Rights) <https://blogs.lse.ac.uk/humanrights/2020/08/10/the-national-register-of-citizens-and-indias-commitment-deficit-to-international-law/> accessed 29 September 2024
5. Sharma R and Velath PM, 'Encountering 'Identity': Refugee Women and the Partition of the Subcontinent' (2021) 4(1) Journal of Migration Affairs 95 <http://dx.doi.org/10.36931/jma.2021.4.1.95-109> accessed 29 September 2024
6. 'Why the CAA+NPR+NRC is a toxic cocktail for everyone | CJP' (CJP) <https://cjp.org.in/why-the-caanprnrc-is-a-toxic-cocktail-for-everyone/> accessed 29 September 2024
7. Tripathi G, Ahad MA and Casalino G, 'A comprehensive review of blockchain technology: Underlying principles and historical background with future challenges' [2023] Decision Analytics Journal 100344 <http://dx.doi.org/10.1016/j.dajour.2023.100344> accessed 29 September 2024
8. 'A PRIMER ON BIOMETRICS FOR ID SYSTEMS | Identification for Development' (Home | Identification for Development) <https://id4d.worldbank.org/id-biometrics-primer> accessed 30 September 2024
9. Dong S and others, 'Blockchain technology and application: an overview' (2023) 9 PeerJ Computer Science e1705 <http://dx.doi.org/10.7717/peerj-cs.1705> accessed 30 September 2024
10. Politou E and others, 'Blockchain Mutability: Challenges and Proposed Solutions' [2020] IEEE Transactions on Emerging Topics in Computing 1 <http://dx.doi.org/10.1109/tetc.2019.2949510> accessed 30 September 2024
11. Kumar A and others, 'A Novel Decentralized Blockchain Architecture for the Preservation of Privacy and Data Security against Cyberattacks in Healthcare' (2022) 22(15) Sensors 5921 <http://dx.doi.org/10.3390/s22155921> accessed 30 September 2024
12. Stockburger L and others, 'Blockchain-Enabled Decentralized Identify Management: The Case of Self-Sovereign Identity in Public Transportation' [2021] Blockchain: Research and Applications 100014 <http://dx.doi.org/10.1016/j.bcr.2021.100014> accessed 30 September 2024
13. Demertzis K and others, 'A Secure and Privacy-Preserving Blockchain-Based XAI-Justice System' (2023) 14(9) Information

- 477
<<http://dx.doi.org/10.3390/info14090477>
> accessed 30 September 2024
12. van Waas L and Jaghai S, 'All Citizens are Created Equal, but Some are More Equal Than Others' (2018) 65(3) Netherlands International Law Review 413
<<http://dx.doi.org/10.1007/s40802-018-0123-8>> accessed 30 September 2024
13. Lescrauwaet L and others, 'Adaptive Legal Frameworks and Economic Dynamics in Emerging Tech-nologies: Navigating the Intersection for Responsible Innovation' (2022) 16(3) Law and Economics 202
<<http://dx.doi.org/10.35335/laweco.v16i3.61>> accessed 30 September 2024
14. 'Blockchain in Government: Enhancing Transparency and Services' (*Smart Sight Innovations*)
<www.smartsight.in/technology/blockchain-in-government-enhancing-transparency-and-services/> accessed 30 September 2024
15. Gad AG and others, 'Emerging Trends in Blockchain Technology and Applications: A Review and Outlook' [2022] Journal of King Saud University - Computer and Information Sciences
<<http://dx.doi.org/10.1016/j.jksuci.2022.03.007>> accessed 30 September 2024
16. (*Public Documents | The World Bank*)
<<https://thedocs.worldbank.org/en/doc/123481461249337484-0050022016/original/WDR16BPBRidgingtheDisabilityDividethroughDigitalTechnologyRAJA.pdf>> accessed 30 September 2024
17. 'India's Citizenship Amendment Act (CAA): Citizenship and Belonging in India' (*PoLAR: Political and Legal Anthropology Review*)
<<https://polarjournal.org/2020/09/07/indias-citizenship-amendment-act-caa-citizenship-and-belonging-in-india/>> accessed 30 September 2024
18. Shuaib M and others, 'Blockchain-based framework for secure and reliable land registry system' (2020) 18(5) TELKOMNIKA (Telecommunication Computing Electronics and Control) 2560
<<http://dx.doi.org/10.12928/telkomnika.v18i5.15787>> accessed 30 September 2024
19. Townley C and Koop C, 'Exploring the potential and limits of digital tools for inclusive regulatory engagement with citizens' (2024) 41(1) Government Information Quarterly 101901
<<http://dx.doi.org/10.1016/j.giq.2023.101901>> accessed 30 September 2024
20. 'Indian Citizenship Law a Mess, Proving Citizenship Even Messier – The Leaflet' (*The Leaflet – An independent platform for cutting-edge, progressive, legal, and political opinion.*)
<<https://theleaflet.in/indian-citizenship-law-a-mess-proving-citizenship-even-messier/>> accessed 30 September 2024
21. Dong S and others, 'Blockchain technology and application: an overview' (2023) 9 PeerJ Computer Science e1705
<<http://dx.doi.org/10.7717/peerj-cs.1705>> accessed 30 September 2024
22. Habib G and others, 'Blockchain Technology: Benefits, Challenges, Applications, and Integration of Blockchain Technology with Cloud Computing' (2022) 14(11) Future Internet 341
<<http://dx.doi.org/10.3390/fi14110341>> accessed 30 September 2024
23. (*Public Documents Search*)
<<https://pubdocs.worldbank.org/en/165711456838073531/WDR16-BP-Estonian-eGov-ecosystem-Vassil.pdf>> accessed 30 September 2024
24. 'Current status, requirements and challenges of Blockchain application in Land registry' (2022) 12(2) International Journal of Information Retrieval Research 0
<<http://dx.doi.org/10.4018/ijirr.299934>> accessed 30 September 2024
25. (*Digital Identities: Design and Uses*)
<https://digitalid.design/docs/CIS_DigitalID_KenyaCaseStudy_2020.02.pdf> accessed 30 September 2024