

# Digital Rupee – the dawn of a revolution in digital payments

March 2023

The EY logo consists of the letters 'EY' in a bold, white, sans-serif font. A yellow chevron shape is positioned above the 'Y'.

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# Foreword

At EY, we are proud to launch a thought leadership series on digital currencies with the aim of covering private and government-controlled digital currencies. The area of coverage for the series is technology consideration, use cases, policy consideration, pricing and risk management, and policy suggestions for digital currencies.

Central Bank Digital Currencies (CBDCs) are set to change the existing payments framework in a significant manner. With respect to India, it may not be wrong to anticipate that once Digital Rupee is introduced with RBI backing, cash transactions in the financial system might drastically reduce. This decrease in paper cash is expected to lead to a reduction in cash management and settlement costs for banks. Settlement time among banks may decrease and traceability and transparency may further improve.



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# Executive summary

Digital payments helped unlock US\$16.4 billion of economic output, which represents 0.56% of the country's GDP<sup>1</sup>. Hence, it was not a surprise when, in November 2021, the Reserve Bank of India announced<sup>2</sup> the next big revolution in digital payments – India's own digital currency, the Digital Rupee<sup>3</sup> or E-Rupee. In this report, the focus is on five important use cases (both wholesale and retail) of Digital Rupee curated in the Indian context; they are:



Though Digital Rupee and other Central Bank Digital Currencies (CBDCs) are expected to have multiple benefits, they also come with their own range of privacy, cyber, monetary, technological, and legal risks and challenges. The transition from physical cash to Digital Rupee is expected to have its own complexities and will involve issues regarding interoperability between Digital Rupee and existing financial infrastructure. Banks will need to increase spends to upgrade their existing technology to communicate with different ledger technologies and platforms not only in India but globally as well. Doing this will have manifold potential benefits. In the Indian context, the series proposes key policy considerations and their design for Digital Rupee to unlock multiple opportunities for stakeholders in the financial ecosystem and beyond.



<sup>1</sup>As per estimates of Centre for Economics and Business Research,

<sup>2</sup><https://pib.gov.in/PressReleaseframePage.aspx?PRID=1882883#:~:text=The pilot in wholesale segment,inter-bank market more efficient.>

<sup>3</sup>[rbidocs.rbi.org.in](https://rbidocs.rbi.org.in)



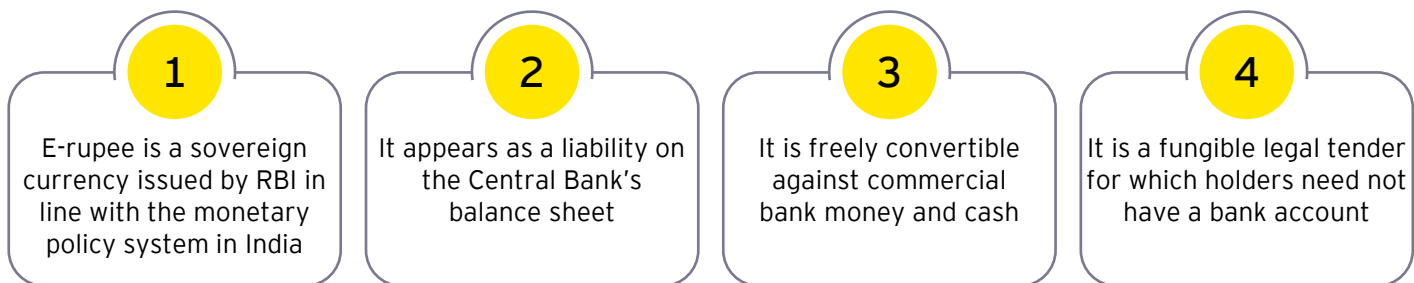


# Digital Rupee – an introduction

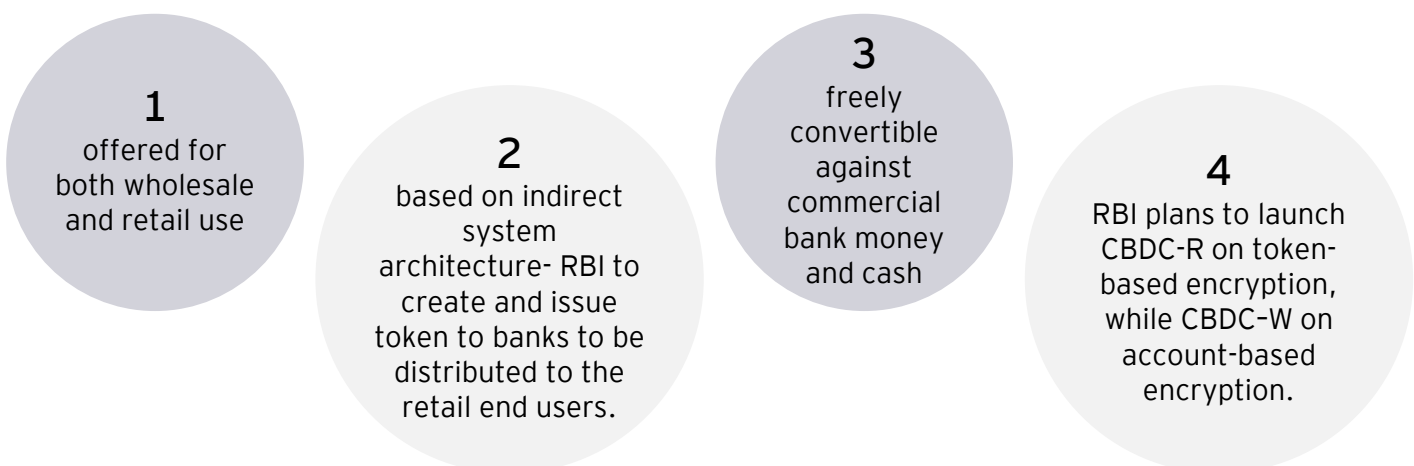
Digital payments' ecosystem has transformed rapidly over the past five years, making India a leader in real-time payments transactions. As per ACI worldwide<sup>4</sup> report, India accounted for the highest number of real-time transactions (48 billion) in 2021,<sup>5</sup> followed by China (18 billion) and Thailand (9.7 billion)<sup>6</sup>. As per the estimates of the Centre for Economics and Business Research, this volume of real-time payments resulted in an estimated cost savings of US\$12.6 billion for Indian businesses and consumers in 2021. This helped unlock US\$16.4 billion of economic output, which represents 0.56% of the country's GDP. Hence, it was not a surprise when, in November 2021, the Reserve Bank of India announced<sup>7</sup> the next big revolution in digital payments – India's own digital currency, the Digital Rupee<sup>8</sup> or E-Rupee.

The RBI issues this currency in denominations same as paper currency, which means that it issues 50 paise and 1 Rupee digital coins, along with 2-,5-,10-,20-,50-,100-,200-,500- and 2000-Rupee digital notes

Central Bank Digital Currencies, or digital currencies (hereafter referred as CBDCs) are digital tokens, like private cryptocurrencies, issued by a Central Bank. According to the RBI, "CBDC is the legal tender issued by a Central Bank in a digital form. It is the same as a sovereign currency and is exchangeable one-to-one with the fiat currency. Apart from the satisfying basic features of money, including store of wealth, medium of exchange, unit of account etc., some key features of the proposed Digital Rupee are listed below:



As per the RBI, Digital Rupee would be:



<sup>4</sup>ACI Worldwide – a leader in real-time payments – delivers the mission-critical real-time payments software solutions that enable corporations to process and manage digital payments, power omni-commerce payments, present and process bill payments, and manage fraud and risk. ([About ACI | ACI Worldwide](#))

<sup>5</sup>[Prime-Time-for-Real-Time-Report-2022.pdf \(aciworldwide.com\)](#)

<sup>6</sup>At 48 billion, India accounts for largest number of real-time transactions in the world - Times of India ([indiatimes.com](#))

<sup>7</sup><https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1882883#:~:text=The pilot in wholesale segment,inter-bank market more efficient.>

<sup>8</sup>[rbi.org.in](https://www.rbi.org.in)

<sup>9</sup>Digital Rupee: Do you need a bank account to transact RBI e-Rupee? - The Economic Times ([indiatimes.com](#))

<sup>10</sup>Digital Rupee - Wikipedia



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## Design consideration of Digital Rupee must be in sync with foundation principles laid by the Bureau of Indian Standards (BIS)

- 1 It should not interfere with public policy objectives or prevent banks from performing their monetary stability mandate (a “do no harm” principle)
- 2 It should be used alongside and complement existing forms of money (the coexistence principle)
- 3 It should promote innovation and competition to increase the overall efficiency and accessibility of the payments system (the innovation and efficiency principle)

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## The two other important design considerations for the Digital Rupee are **anonymity** and **offline use**

Anonymity of a cash transaction is a unique feature which would also be desirable if CBDC needs to co-exist with the physical notes. CBDC, by virtue, is a digital transaction, thus leaving a digital trail. One of the major debates among the regulators around the world is the degree of anonymity of CBDC. Given the risks involved; it is believed that CBDC would not be as anonymous as the physical cash. The aspect is explored in detail in the policy consideration section of the document.

For mass adoption, another key design consideration that is important is offline use of CBDC. An offline payment is a payment working without connectivity to the network hosting the ledger of transactions. Offline payment system can be used to instantly complete a transaction involving any form of digital currency over a point-to-point channel without communicating with any payment intermediary. Today, there are several existing protocols for exchanging tokens offline which are usable for specific DLTs. They allow temporary offline exchanges but still require an initial and final settlement online. As such, they do not resemble the kind of banknote exchange one may wish for CBDC<sup>11</sup>.

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<sup>11</sup>[white-paper-mind-gap-between-ledger-and-offline-wallet \(idemia.com\)](https://www.idemia.com/white-paper-mind-gap-between-ledger-and-offline-wallet)







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## Offline CBDCs can be characterized as per its settlement timing

### *Delayed*

The payer and the payee are temporarily offline. The payer exchanges a transaction with the payee. If the payee wants to spend that amount, they need to redeem online first. This resembles today's model for debit cards where a customer pays a merchant, and that merchant redeems online regularly. The merchant needs to clear and settle that transaction online.

### *Immediate*

The payer and the payee exchange a transaction offline. The payee can immediately spend the freshly received amount to pay another peer offline. Redeeming online becomes unnecessary.

The CBDC wallet user can initiate offline payments using any channel: contactless, email, QR Code, and the same terminals and standards currently used for card payments. The offline CBDC payments can be received by any device (secured or not), with or without an internet connection to the ledger. CBDC users can also send and receive funds by exchanging multi-digit authorization codes, either manually or using near-field communication (NFC) connections. Some of the pilots globally that are being tested out include Sand Dollar (Bahamas), Eastern Caribbean Central Bank, Central Bank of Uruguay, Central Bank of Nigeria, People's Bank of China and Bank of Jamaica.

The document is broken down into four subsequent sections. Section 2 is dedicated to international case studies and development, Section 3 talks about the policy consideration important in the Indian context and Section 4 is dedicated to key use cases for CBDCs in the Indian context. Some of the use cases discussed here include programmability and financial inclusion, cross-border use cases, offline CBDC, and finally securities settlement.



# Zooming into CBDCs in North America, Europe and Asia Pacific





This section presents a spotlight on three continents around the globe, where CBDCs have picked the highest steam. In North America, the focus is on the US, Canada and Jamaica. In Europe, the focus is on the UK, Germany, France, and Switzerland. Finally, in Asia Pacific, the focus is on China, Japan, India, Australia, Singapore, and Hong Kong.

It can be observed from the summary below that in every CBDC pilot, the design choice is non-interest bearing, if decided. Most countries have chosen to go ahead with Distributed Ledger Technology (DLT). In Asia, most countries are in the latter stages of development and early stages of pilot, while the US and the UK remain in the research phase.

## North America

#	Country	US	Canada	Jamaica
1	Digital Currency	USA CBDC	Jasper	JAM-DEX
2	Central Bank(s)	US Federal Reserve	Bank of Canada (BoC)	Bank of Jamaica
3	Goal/Agenda	While the US has not yet decided whether it will pursue a CBDC, the US has been closely examining the implications of, and options for, issuing a CBDC.	Build the capability to launch a national digital currency should the need arise and has explored cross-border digital payments through Project Jasper.	The primary motivation associated with developing the CBDC was to reduce the storage and handling costs of cash usage.
4	Current Status	Research - Established working groups to explore the use cases, impact, and feasibility of a CBDC	Pilot - Initiated small-scale testing of a CBDC in the real world with a limited number of participants	Launched - Issued a CBDC for widespread retail use.
5	Domain	Wholesale	Wholesale	Retail
6	Structure	Tokenized	Account based/Tokenized	Tokenized
7	Is Interest bearing	Undecided	No	No
8	Underlying Technology	Undecided	Distributed Ledger Technology (DLT)	Conventional (non-DLT)
9	Technology Partner	Undecided	None	eCurrency Mint
10	Cross-border Projects	None	Project Jasper	None
11	Regulatory Whitepaper	<a href="#">Document</a>	<a href="#">Document</a>	<a href="#">Document</a>




## Europe

#	Country	UK	Germany	France	Switzerland
1	Digital Currency	United Kingdom CBDC	Digital Euro	France CBDC	Swiss CBDC
2	Central Bank(s)	Bank of England	European Central Bank, Bundesbank	European Central Bank, Banque de France	Swiss National Bank
3	Goal/Agenda	<p>A CBDC would be a new form of digital money issued by the Bank of England and for use by households and businesses. It would exist alongside cash and bank deposits, rather than replacing them.</p> <p>The government and the Bank of England have not yet decided on whether to introduce a CBDC in the UK, and will engage widely with stakeholders on the benefits, risks and practicalities of doing so.</p>	<p>Germany's central bank, the Bundesbank, is taking a conservative approach towards adopting a digital Euro. It is currently evaluating a digital currency's potential benefits and downsides, as well as risks and opportunities.</p>	<p>To check the Interoperability across platforms, which is a key element to maximize the benefits of the distributed ledger technology applied to financial markets. By achieving the transfer of data and assets, as well as the exchange of assets across different blockchains in an atomic way, the Banque de France and HSBC have demonstrated the possibility of such interoperability, essential to ensure that the multiple environments, on which the efficient functioning of markets rely, can coexist.</p>	<p>The Swiss National Bank (SNB) announced that it did not see any need for a retail central bank digital currency (CBDC). However, the SNB has been active in wholesale CBDC testing through Project Helvetia, which was successful in integrating a wholesale CBDC system in the core banking infrastructure of the country.</p>
4	Current Status	Research - established working groups to explore the use cases, impact, and feasibility of a CBDC	Development - initiated technical build and early testing of a CBDC in controlled environments	Pilot - initiated small-scale testing of a CBDC in the real world with a limited number of participants	Research - established working groups to explore the use cases, impact, and feasibility of a CBDC
5	Domain	Wholesale	Retail/Wholesale	Wholesale	Wholesale
6	Structure	Undecided	Account based/Tokenized	Tokenized	Tokenized
7	Is Interest bearing	Undecided	No	No	Undecided
8	Underlying Technology	Undecided	Conventional and DLT	DLT	Undecided
9	Technology Partner	Undecided	None	None	SIX
10	Cross-border Projects	Undecided	Digital Euro	Digital Euro	Project Helvetia, Project Jura
11	Regulatory whitepaper	<a href="#">Document 1</a> , <a href="#">Document 2</a>	<a href="#">Document</a>	<a href="#">Document</a>	<a href="#">Document</a>

## Asia Pacific (APAC)

#	Country	China	Japan	Australia	India	Singapore	Hongkong
1	Digital Currency	e-CNY	Digital Yen	eAUD	Digital Rupee	Ubin	Hongkong CBDC (e-HKD)
2	Central Bank(s)	People's Bank of China	Bank of Japan	Reserve Bank of Australia	Reserve Bank of India	Monetary Authority of Singapore	Hong Kong Monetary Authority (HKMA)
3	Goal/ Agenda	Provide a convenient, yet more efficient, and secure retail payments system to increase financial inclusion, preserve monetary sovereignty, and to provide a backup payments infrastructure for the private sector payments solutions.	BoJ currently has no plan to issue CBDC, but to ensure stability and efficiency of the overall payments and settlement systems, the Bank considers it important to prepare thoroughly to respond to changes in circumstances in an appropriate manner.	Understand potential new business model that CBDC might support. RBA is actively exploring the use of a wholesale eAUD through its involvement in Project Atom and Project Dunbar.	Create a Digital Rupee that is as close as possible to a paper currency. RBI is also interested in reducing the cost of storing, printing, and transporting cash by using CBDCs. RBI cited the widespread adoption of commercial cryptocurrencies and the advantages of a CBDC as a less volatile digital asset.	The project has three main objectives: (i) explore the design and application of AMMs for wCBDCs. (ii) investigate if a supra-regional network could work as an efficient and trusted hub for cross-border settlement and (iii) research wCBDC governance models within that network.	The project is driven by improving the access and use of central bank digital money, providing competition to commercial crypto, and supporting innovation. In September 2022, the HKMA announced that it would begin the pilot of e-HKD in Q4 of 2022.
4	Current Status	Pilot - Initiated small-scale testing of a CBDC in the real world with a limited number of participants.	Development - Initiated technical build and early testing of a CBDC in controlled environments	Development - Initiated technical build and early testing of a CBDC in controlled environments.	Development - Initiated technical build and early testing of a CBDC in controlled environments.	Pilot - Initiated small-scale testing of a CBDC in the real world with a limited number of participants.	Pilot - Initiated small-scale testing of a CBDC in the real world with a limited number of participants.
5	Domain	Retail/ Wholesale	Retail/ Wholesale	Wholesale	Retail/ Wholesale	Wholesale	Retail/Wholesale
6	Structure	Account based	Account based/Tokenized	Tokenized	Undecided	Tokenized	Undecided
7	Is Interest bearing	No	Undecided	No	No	No	No
8	Underlying Technology	Conventional (non-DLT)	Conventional (non-DLT)	DLT	Undecided	DLT	DLT
9	Technology Partner	None	None	Kaleido	None	None	None
10	Cross-border Projects	mCBDC Bridge	Project Stella	Project Dunbar	NA	Project Jasper, Dunbar	mCBDC Bridge
11	Regulatory whitepaper	<a href="#">Document</a>	<a href="#">Document</a>	<a href="#">Document</a>	<a href="#">Document</a>	<a href="#">Document</a>	<a href="#">Document</a>





# Policy consideration for India – what needs to change?



To unlock the gains from digital currencies, the central government and planning groups (we refer to as planner in the document henceforth) need to focus on areas of scalability, regulatory and privacy framework, operation standardization and technological considerations. These considerations are discussed more in detail in this section.

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## Scalability consideration

For any digital currency to scale, there needs to be an acceptance by all stakeholders involved. Here, policy consideration for greater acceptance of E-Rupee from the point of view of end users and commercial banks/intermediaries is presented.

A similar problem might be encountered for domestic transactions. Initially, not all commercial banks will jump on the E-rupee bandwagon immediately. Banks would do their own costs benefit analysis to decide on the feasibility of offering such services to their wholesale and retail customers. The requisite infrastructure to connect to the CBDC system might be too expensive to put in place and hence, **the planner needs to incentivize** the commercial banks to take up CBDC at large scale while keeping their policy objective of launching E-rupee in mind. **The planner needs to ensure that the underlying technology of the digital currency is such that it can offer maximum interoperability compatible with legacy systems.** Finally, Central banks would also need to be sure that the CBDC system would not lead to **excessive crowding out of private sector services and their revenue models, like revenues from transaction fees, etc.**

Another major scalability consideration, probably the most pivotal one, is the **end user's acceptance** of a CBDC. CBDC wallet design and features could influence the public's willingness to use a CBDC. Wallet design considerations, such as ease of use, convenience, stability, and a user-friendly interface could lead to a positive experience for individuals and other end users. Security and data protection measures, which should be carefully designed and effectively communicated in consumer awareness campaigns, are also paramount for ensuring consumer trust. To serve to the rich diversity of India, the CBDC wallets could be made multi-linguistic with an easy user interface and operations like voice control. Wallets that can provide voice guidance or commands to operate are important features to enable access to unserved or underserved users (e.g., the visually impaired) in the CBDC ecosystem. Finally, as discussed previously in the document, the government also can launch two versions of the E-rupee app, one for low-end smartphones and the other one for high-end smartphones. The first app would ensure greater reach and acceptability while the latter would ensure a better consumer experience for the middle to higher-income users.

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## Legal and regulatory framework

Divergent or non-harmonized legal/regulatory frameworks can pose various challenges for CBDC arrangements, both nationally and internationally. For cross-border payments, regulations, and laws (such as combatting the financing of terrorism (CFT), tax laws, and privacy rules) differ across different jurisdictions. Hence, for each nation and its respective payment infrastructure, there are dependencies on one or many other jurisdictions. Hence, this could lead to a divergent, non-harmonized, and uncertain legal and regulatory framework. Regardless of the model chosen, a CBDC arrangement requires strong coordination among participating central banks to address illicit finance and to strike a balance between protecting the privacy and combating illegal activities. Anti-Money Laundering/Combating the Financing of Terrorism (AML/CFT) processes are more challenging in a cross-border context. Different jurisdictions might have different thresholds to identify significant transactions that require enhanced due diligence.

For users, onboarding KYC norms and compliance is critical. The government needs to plan out the minimal ID requirement for onboarding and KYC such that the digital currency footprint can be maximized. The problem of customer identification and onboarding

becomes an amplified issue for cross-border payments. There needs to be a joint effort from various central banks, multi-lateral agencies, and central governments to chalk out this requirement. Identification is important for the implementation of AML/CFT, as well as for the enforcement of any caps or limits imposed on payers and/or account holders. One possible solution to the above seems to be using passport information for user onboarding, but non-residents while abroad may not have the access to this because of various reasons like-massive population displacement caused by war, political instability, or a natural disaster.

Finally, in anonymous transactions, the planner would also have to take into account AML/CFT concerns and requirements. To date, it is not clear how AML/CFT requirements can be implemented practically for anonymous forms of CBDC. Forms of CBDC that can be easily transferred across borders or used offshore are especially likely to present significant challenges in this respect. As such, the reputational risk to the central bank from a general-purpose CBDC must be considered.

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## Macroeconomic considerations, focus on cross-border payments

In an ideal, frictionless, and cross-border payment world, increased capital flows and financial integration can also allow contagion effects, and sudden capital flow reversals that can undermine economic and financial stability. This would mean knock-on effects on current account balances and potential balances of payments problems. As per IMF and World Bank<sup>12</sup>, CBDCs can also amplify the problem of currency substitution. Depending on design and regulations, the cross-border availability of CBDCs could lower the costs of obtaining, storing, and spending foreign currency. This could contribute to more widespread currency substitution via the adoption of a foreign CBDC, especially in countries with high inflation and volatile exchange rates. This can lead to the weakening of monetary policy transmission with a large impact on the monetary policy independence of the Central Bank. Finally, the Central Bank can also fail to act as a lender of 'last resort'. The reason is that if domestic banks have large liabilities in non-domestic currency, which might occur as the result of extensive currency substitution, the central bank will not be able to create foreign currency to provide liquidity assistance and must instead rely on currency reserves or liquidity provisions from foreign central banks.

One possible solution for these can be offered by programmable CBDC. CBDC could be designed by issuing central banks to limit their use outside the issuing country, or wallets in recipient countries could be designed to allow local authorities to implement certain capital flow management measures and limits on non-resident holdings. Another possible solution could be tactical pricing mechanisms (e.g., fees on very large or frequent cross-border transactions) to limit cross-border use. The multilateral collaboration will be key as well. It may be possible to agree on design principles to allow foreign authorities to set basic parameters of wallets or networks to limit currency substitution.

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<sup>12</sup><https://openknowledge.worldbank.org/bitstream/handle/10986/36764/Central-Bank-Digital-Currencies-for-Cross-border-Payments-A-Review-of-Current-Experiments-and-Ideas.pdf>

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## Technology consideration and standardization

There seems to be a lack of technological coordination in the international payments market. Insufficient technical standardization in areas such as message formats, data elements, cryptographic algorithms, and numbering and coding systems would cause friction and inefficiencies when attempting to achieve interoperability between different CBDC systems.

Hence, **payment platforms/intermediaries need to be regulated by agreements. The digital currency infrastructure needs to operate with a detailed and articulated agreement and this needs to be established from the very outset, covering most of the relevant issues and identifying the applicable law.** Once drafted, this needs to be discussed and signed off by oversight authorities and then adopted in pilots and actual go-live projects. **Here, multiple central banks are involved, they are expected to cooperate with each other and try to solve any emerging conflict.**

Another important technology consideration is that of cyber security. It would be essential to ensure the resilience of all the systems and models. Other challenges are related to data warehousing rules. Data warehousing would be complex because data localization requirements could prove challenging to implement. Both these problems, that of cyber security and data warehousing, are prevalent in domestic and international payment use cases, but the problems do get amplified in cross-border use cases. This is because the operational setup of cross-border payments needs to comply with the laws and regulations of multiple jurisdictions. Also, the underlying technology of cross-border payments is dependent on a central node (the 'weaker link') and hence more exposed to cyber-attacks. Domestically, this 'weaker link' of the digital currency would be present at the contact points where the traditional technology and DLT interact, basically the underlying technology offering features of interoperability. All parties connected to this infrastructure – the central bank, financial intermediaries, mobile phone operators, merchants, etc. – should have effective cyber security safeguards and processes in place.





A silhouette of a person in profile, looking through binoculars. The background is a bright sunset or sunrise with a lens flare effect. The person is wearing a dark jacket.

# Use cases – from India's perspective

This section introduces a set of curated use cases of CBDC that can provide maximum social benefit for mix and diverse economy like India. The focus is on the use of programmable CBDC in Pradhan Mantri Jan Dhan Yojana (PMJDY) to increase its reach and access, followed by a use case of CBDCs in cross-border transaction. The section also includes the use of offline CBDC in disaster relief operations and Financial Inclusion. Lastly,, the section puts a spotlight on the possible use of CBDC in relaxing some of the credit constraints for MSMEs and possibly increasing Financial Inclusion in India.

## Programmable CBDC and financial inclusion

An interesting application of CBDC is the technical possibility of programmability. Digital currencies have the capability to 'program' the end use.

Programmability can take various forms. It can be in the form of smart contracts or token-based. Within token-based, there could be further end uses of these tokens like equity tokens (only be used to buy equities), and utility tokens (allow you access to a company's goods or services. These tokens are designed with the expectation that users will utilize them and the services to which they are linked, rather than retaining them.), etc. In this note, the focus is on the use cases that are relevant to the Indian context.

Financial inclusion plays an important role in the process of economic progress by developing a culture of savings among a large segment of the population and broadening the resource base of financial systems. Further, by bringing low-income groups within the perimeter of the formal banking sector, financial inclusion protects their financial wealth and other resources in exigent circumstances. Financial inclusion also mitigates the exploitation of vulnerable sections by usurious money lenders by facilitating easy access to formal credit. Research shows that countries with deeper levels of financial inclusion– defined as access to affordable, appropriate financial services – have stronger GDP growth rates and lower income inequality. Notably, there are positive consequences of having access to formal saving instruments on increased savings, productive investment, consumption, and overall empowerment<sup>13</sup>.

Financial Inclusion has been a thrust area for the government, the RBI, and other regulators, with several steps having been taken and significant progress made over the years. The social benefit of launching programmable CBDC can be seen in areas of direct benefit transfer. One possible use case can be in increasing the impact of the Pradhan Mantri Jan Dhan Yojana (PMJDY).

Programmable CBDCs can solve various issues in the implementation of PMJDY. These include- solving the issue of unbanked, infrastructure and cost issues, idleness of bank accounts, and the problem with misuse of the final compensation amount.

The PMJDY program is a much-needed one, but not entirely free of its challenges. Various researchers and public policy commentators<sup>14</sup> have tried to highlight these challenges and are provided below with possible solutions using CBDC. CBDC specifically helps in the following way:

- ▶ With the introduction of programmable CBDC, the government may be able to onboard the beneficiaries with a valid Aadhaar Card but without a functioning Bank account
- ▶ Programmable CBDC as the pay-out can be 'programmed' to only go to those wallets, where there has been an active transaction in the last 45 days. Also, since the use of the Digital Rupee is envisaged to be easier than that of traditional money, the velocity of fund transfer within the unbanked community is expected to be higher and hence the base of legitimate insurance coverage would be broader than before.
- ▶ If the Digital Rupee pay-out from the PMJDY can be programmed such that the beneficiaries can only spend the amount received on certain pre-specified avenues that are essential in nature and would lead to better living conditions, then it might lead to a more optimal outcome socially, e.g., of such essential goods could be on the health sector, education sector, food and consumption, and asset building opportunities.

<sup>13</sup>India's 'Financial Inclusion Index' is 53.9 by the end of March 2021 (factly.in)

<sup>14</sup>Pradhan-Mantri-Jan-Dhan-Yojana-PMJDY-The-Biggest-Financial-Inclusion-Initiative-in-the-World.pdf (researchgate.net)  
EBSCOhost | 123164651 | PRADHAN MANTRI JAN DHAN YOJANA - AN EXPLORATORY STUDY OF BANKS PARTICIPATION IN FINANCIAL INCLUSION IN INDORE DISTRICT.

Crop Insurance in India.pdf (indiaenvironmentportal.org.in)

Pradhan-Mantri-Jan-Dhan-Yojana-PMJDY-Issues-and-Challenges-BACKGROUND-OF-THE-STUDY.pdf (researchgate.net)

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## Cross-border transactions via CBDC

Currently, cross-border transactions are based on closed loop systems<sup>15</sup>. This means that payments from country cannot be directly transferred to another country as there is no single 'payment corridor' allowing users to do so. In the current framework, the smoothest way to transact in cross-border payments is when the same Bank has branches in both home and foreign country, hence incurring high fixed costs. Here, the bank first sends an instruction to debit an account in Country A and credit an account in country B. But such payment corridors are rare since the same bank might not have branches in both countries. In such scenarios, the sender or receiver of money must use a single correspondent bank, or multiple such correspondent bank based on the currency liquidity. The more intermediaries that are involved in a cross-border transaction, the slower and more expensive it will be. According to OliverWyman<sup>16</sup>, Global corporates move nearly US\$23.5 trillion across countries annually, equivalent to about 25% of global GDP and this incurs a transaction fee of US\$120 Million (excluding FX Costs). The costs come over and above the problem of delayed settlements. Furthermore, the settlement, on an average, takes two to three business days.

The advent of CBDC can solve some of the above-mentioned problems. The leading solutions to these problems can be broken down in four pillars, as suggested by World Bank<sup>17</sup> and BIS<sup>18</sup>. They are:

### Cost

Most CBDCs are based on advanced centralized ledger technology which is scalable at costs marginal to that of the traditional technology<sup>19</sup>. Hence, banks (mostly smaller banks) that earlier were not able to participate in the cross-border segment can now be involved in the marketplace as well. Due to this greater competition and lower costs on the supply side, the end user of the cross-border transaction would now be able to make payments with lower costs, both hidden and upfront<sup>20</sup>. The traditional framework of cross-border transactions has various associated costs like Overheads, Network operating and management costs, FX settlement costs, compliance, treasury and claims costs, Nostro-Vostro Liquidity, and payment operation costs. With the introduction of CBDCs, each of these costs would be scaled down substantially, if not made redundant completely.

### Transparency

Since CBDCs are based on DLTs or ledger-based technologies where the new transactions can be appended while the old transactions cannot be amended or deleted, it offers regulators a way to trace and collect relevant information to check compliance of individual transactions in line with CFT and AML regulations, both domestically and internationally. This seamless transfer of data is not possible in the existing framework due to presence of multiple intermediaries in form of banks and payment gateways. Transparency in its absolute form might not be a key benefit for CBDCs, but it would only be a powerful use case in cases where regulations allow harmonization of user onboarding and offboarding requirements, along with other aspects, which are later discussed in the document.

### Speed

Project Cedar, a pilot project of New York (NY) Fed in the US, has been successful. In test scenarios, FX spot trades were automatically or simultaneously settled or else the transaction fails, in under ten seconds, with throughput increasing as the number of currencies increased<sup>21</sup>. Hence, the advanced Blockchain-based technology has the capability to reduce the transaction time by a significant amount.

### Access

Since CBDCs would be built on a single platform with the possibility of atomic transactions, the hinderance of different time zone and delayed settlements will be mitigated. The transaction could be allowed to be made all around the year and for 24 hours a day. Additionally, the traditional mechanism facilitates the cross-currency payment by ensuring that the entity responsible for the conversion must have sufficient balances of the different currencies. The treasury departments of the involved entities monitor their holdings of each currency and determine when they must buy and sell currencies to cover their transactions, typically in nostro-vostro accounts. This leads to banks imposing cut-offs on the maximum withdrawal from corporates or even a temporary freeze on cross-border transactions.

CBDCs are expected to improve the safety of cross-border payments because payments would be made using a direct liability of the central bank, which is the safest and most liquid settlement asset. Moreover, there would no more be the need for third parties to act as liquidity providers. This would mean that the proposition of cross-border transactions would be less cumbersome for both corporate and retail users and hence, may possibly expand the user base of cross-border transactions.

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<sup>15</sup>Cross-border payments | Bank of England

<sup>16</sup> Unlocking \$120 Billion Value In Cross-border Payments (oliverwyman.com)

<sup>17</sup>World Bank Document

<sup>18</sup>Central bank digital currencies for cross-border payments (bis.org)

<sup>19</sup>An example of this is M10 hierarchal ledger technology which can process over 1 million transaction per second- Technology | M10

<sup>20</sup>A-vision-for-the-future-of-cross-border-payments-web-final.ashx (mckinsey.com)

<sup>21</sup>FX spot settlement in 10 seconds: NY Fed releases results of wholesale CBDC research (cointelegraph.com)



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## Offline CBDC and financing MSMEs

The design choice of CBDCs in the Indian context can be quite challenging and can prove to be a global case study. This is because India is in a diverse and unique spot, both geographically and economically. The features and functionalities of CBDC need to ensure that it minimizes the gap between those who are positioned favourably, geographically, and economically, vs. the ones who are not that fortunate.

It is important that CBDCs are designed to support offline payments and a secure payment system protocol that can allow a user to make a payment while both the sender and receiver are offline. Offline functionality must solve the online checks and

validation performed by the core network when connected. Offline payment functionality is needed to keep business and payments moving in case of: Network connectivity issues or outages, such as cases of natural disasters, remote areas with frequent loss of power and internet connectivity and few networks dead spots.

To highlight the same, the focus is on two use cases of CBDCs here. The first use case of CBDC discusses a solution for constraint in access to credit markets for MSMEs and the second case study discusses the use of offline CBDC in disaster-prone areas of India.

### Credit constraints for MSMEs

As per Asian Development Bank<sup>22</sup>, a concerning fact for MSMEs in India is that almost 93% do not access any outside funding while a little more than 5% use institutional finance and 2% use noninstitutional finance. Even among registered MSMEs, only 11% access institutional finance. In addition to this, some of the key problems faced by MSMEs in India are:

#### Lack of historical data for credit scoring models

A major hurdle for MSME financing is the information opacity prevalent in the sector, as many of the units do not have complete accounting records, audited financial statements, or well-articulated business plans. This makes credit assessment by potential lenders very difficult. Lenders may need to help the enterprises put together these documents, which may again increase transaction costs, especially relative to the small-ticket nature of such loans.

#### Lack of credit histories and collateral

There is a lack of historical data on financial accounts and transactions. This makes the MSMEs possess little to no credit history and collateral to show and it makes lending to them even a riskier proposition for banks.

Large-scale use of the Digital Rupee, or a large substitution of fiat money to the Digital Rupee, can eliminate most of these above-stated problems partially, if not completely.

An account or token-based Digital Rupee using a ledger-based technology would mean that every business, no matter how small, would have a history of all their transactions in an immutable or editable ledger of verified and confirmed transactions. This history of transactions can be available as wallet history. This would offer the much-needed 'auditable and well-articulated history of accounting records. Banks can possibly use this data in their traditional credit scoring models to make proper credit assessments of MSMEs. This would also possibly mean that the initial costs of the loan appraisal process for MSMEs would come down and this benefit should ideally trickle down to MSMEs looking for small unit value loans.



#### High transaction costs

A very detailed loan appraisal of an MSME could reduce the risk of lending, but could lead to very high transaction costs. Given the small unit value of typical MSME loans, such a high transaction cost could make lending to MSMEs unviable.

#### High-interest rates

A combination of all the above points means that even when MSMEs do access loans, the interest rates on these loans are frequently higher than those on loans available by larger corporates. This is because when lending norms and models applied to large enterprises are applied to MSMEs, the ratings obtained by MSMEs are lower, resulting in higher interest rates being applied to loans available by them.

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<sup>22</sup>The role of credit rating agencies in addressing gaps in micro and small enterprise financing: The case of India (econstor.eu)

## Providing benefits and relief to disaster-prone areas

According to the National Disaster Management Authority<sup>23</sup>, around 40 million hectares of land in India is exposed to floods (around 12% of the total land area), 68% of the land is vulnerable to droughts, landslides and avalanches, 58.6% landmass is earthquake-prone, and tsunamis and cyclones are a regular phenomenon for 5,700 km of the 7,516-km long coastal line. Such vulnerable conditions have placed India amongst the top disaster-prone countries. According to the Global Climate Risk Index report 2019, India is the 14th most vulnerable country in the world, due to extreme weather-related events.

With Digital Rupee, the government would be able to send direct remittances to those affected in such calamities. Currently, the government relies on air dropping such benefits to the affected areas with help of high-end GIS technologies and local intelligence. It would also allow as an alternate way for retail users to transact money where the traditional rupee fails due to banking infrastructural failure like the internet, ATMs, physical bank locations, etc.

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## Settlement of securities

RBI has already initiated a pilot for tokenized G-Sec issuance using a CBDC (DLT based) platform. This can be further expanded for settlement of other financial securities like Equities, Mutual Funds, Corporate Bonds, Municipal Bonds, Options, FX spot, etc. The current wholesale E-rupee pilot offered an instantaneous settlement to the selected few government securities. If this pilot can be scaled, then it would possibly lead to lower liquidity and credit risk requirements for the market participant and offer better flexibility for financial planning to both retail and wholesale players.

In the current process, the following is the flow toward settlement:

Transaction was done >> deal slip generated >> verification of deal slips and back-office reconciliation >> confirmation to counterparty >> order matching In NDS-OM >> deal details flow to CCIL >> settled In T+1 days >> securities account credited and debited.

The settlement cannot be done instantaneously in the current framework, primarily because there are multiple reconciliations and reporting involved along with interlinkages and dependency for multiple platforms. With the introduction of CBDC, there would be a common data and ledger platform that can be verified and shared with multiple players and hence eliminated the need for multiple reconciliation. It also eliminates the need for multiple record keeping.

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<sup>23</sup>India is not prepared for natural disasters - The Hindu BusinessLine





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# Conclusion

Digital Rupee can be beneficial for the Indian economy in various aspects, such as financial inclusion, MSME financing, cross-border payments and securities settlement, among others. The policymakers should consider all the challenges and design policies that directly facilitate the adoption of Digital Rupee and need to facilitate an environment where the private sector participation is maximized by incentivizing them to invest in adopting new technology and upgrading their legacy systems. The digital revolution has started in India way back in 2015 and we all hope the launch of CBDCs would take the country to even higher levels of digitization and financial inclusion.



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