



PwC Global CBDC Index and Stablecoin Overview 2023

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From cash to crypto: the evolution of digital money

In an age characterised by the relentless advance of technology, from communication and commerce to entertainment and education, the pervasive influence of digitisation is unmistakable. Amidst this sweeping transformation, one element emerges as both emblematic of our digital era and fundamental to our daily existence: money. The evolution from physical cash and legacy payment rails to digital currencies and blockchain technology has been defined by one revolutionary concept – the creation of digitally unique, uncopyable assets. This distinguishing feature defines cryptocurrencies and digital assets, and the financial markets have not remained indifferent to this seismic shift.

Both public and private participants in the ecosystem have embarked on ambitious blockchain initiatives. Central banks, custodians of monetary policy, have commenced the introduction of Central Bank Digital Currencies (CBCs). Meanwhile, private entities, encompassing major banks, payment network providers, and innovative market newcomers, have boldly pursued their own digital currency ventures. These initiatives, ranging from publicly tradable Stablecoins to institution-specific deposit tokens, are reshaping the financial landscape.

In this report we will review:

Central Bank Digital Currency (CBDC): CBDCs are digital representations of a nation's official fiat currency, issued and regulated by the central bank and government authorities. These digital currencies are designed to combine the advantages of cryptocurrencies, such as fast and secure transactions enabled by blockchain technology, with the stability and trust associated with traditional fiat currencies. CBDCs are typically considered legal tender and are backed by the full faith and credit of the issuing central bank.

Stablecoin: Stablecoins are a type of cryptocurrency engineered to mitigate price volatility by pegging their value to a stable asset or a reserve of assets, which could include fiat currencies, commodities, or a combination of these. The primary aim of stablecoins is to address one of the principal concerns associated with cryptocurrencies - their significant price fluctuations. By maintaining a relatively stable value, stablecoins offer the benefits of rapid and secure digital transactions while providing a level of stability akin to traditional fiat currencies.

Deposit Token: Deposit tokens are digital tokens which serve as evidence of claims against a commercial bank, representing the same claims as those held in deposit accounts today. These tokens essentially represent deposits in a digital form and can be transferred or exchanged as a means of payment or settlement. Deposit tokens offer a modernised way to access and utilise traditional bank deposits, often with enhanced flexibility and efficiency compared to traditional banking systems.

As we progress along the evolutionary path of digital assets, we do so against the backdrop of an environment awaiting regulatory clarity for these digital instruments. Uncertainties persist, and challenges are ever-present. Nonetheless, it is within this dynamic environment that we aim to provide a comprehensive overview of the events and progress of the past year. This report's objective is to illuminate the milestones, partnerships, and trends that have moulded the realm of digital money, while offering insights into the future that lies ahead.



CBDC project progress in 2023

CBDC development continues...

In 2023, global central banks have continued to engage in the development of retail and wholesale central bank digital currencies (CBDC).

93% of central banks are engaged in CBDC development, while nearly 20% are expected to issue a digital currency in the near term.¹

At the time of writing, three jurisdictions have a fully live retail CBDC: the Bahamas, Jamaica and Nigeria. Eastern Caribbean and Mainland China projects remain at near-live stage, defined in this report as advanced long-term consumer pilot projects.

This report outlines some of the biggest retail and wholesale CBDC projects globally. This year, the index excludes the above live/near-live jurisdictions.

As a result, India leads the way in PwC's 2023 CBDC Index, with its digital rupee development. The country is undertaking retail and wholesale pilots and is expected to issue a fully live CBDC in 2024. The runner-up, Ukraine, is speeding up its e-hryvnia development due to the Russian invasion. Russia is also advancing its CBDC development due to the ongoing global sanctions, and is planning to launch the digital ruble in 2025, after completing the on-going pilots with private banks.²

Outside the retail CBDC top ten, the European Union (EU) is likely to announce concrete plans for the digital euro in 2023, with the CBDC potentially in circulation by 2026 at the earliest.³ The Bank of England has indicated that a retail CBDC is 'likely' needed, but has not yet confirmed the issuance or expected timelines.

The political motivations for a legal digital tender vary between jurisdictions. Typical drivers include a decline in cash use, financial stability, monetary policy implementation, domestic and cross-border payments efficiency, payments safety and robustness, financial inclusion, competition, innovation and the increase of privately issued digital assets, including stablecoins.

The vast majority of central banks are planning to issue a retail CBDC in collaboration with the private sector banks and payments firms, rather than distributing CBDCs directly to consumers.

...but it's a slow-moving train

The Bank for International Settlements (BIS) suggests that there could be 15 retail and nine wholesale CBDCs circulating publicly in 2030.¹

But not all active work is leading to a short-term CBDC adoption. Several countries including Australia, Canada, Israel, Sweden and the United States have indicated that a decision on a CBDC launch is likely to take several years longer to reach. According to the central bankers, there is no reason to rush on the basis that the technical solution works, if the underlying justifications to implement a CBDC do not exist.

Critics would also raise concerns about the risks to financial privacy, financial freedom, stability of the private sector banking system and credit creation, cost of implementation as well as the lack of tangible consumer benefits and, as a result, low adoption in the already live jurisdictions.

Yet, economies are becoming increasingly digital. The use of central banks' cash is in decline and new digital money use cases will emerge. Considering that the research, testing and piloting - as well as the related legislative, regulatory and technological changes - will take several years to develop and implement, most central banks continue push forward with the groundwork, acknowledging that in the future a CBDC could be required.

Section 1 of this report details the 2023 Global CBDC Index for both retail and wholesale projects. Section 3 provides further details on individual CBDC projects around the world.



¹BIS: BIS Papers No 136 Making headway – Results of the 2022 BIS survey on central bank digital currencies and crypto, July 2023, p 1

²Newspaper "Vedomosti", finance section: article "When and How the digital ruble get implemented in Russia", 10 August 2023 (in Russian)

³Sibos 2023: Digital euro - all you need to know, 21 September 2023.

Stablecoins mature in 2023

Stablecoins are a key component of the digital asset space...

Central banks' exploration of digital forms of central bank issued currency is largely in response to the increased acceptance of digital assets and stablecoins. While both CBDCs and stablecoins are part of the digital transformation of money, they differ in their issuance, regulation, and intended purpose(s).

While CBDCs are government-backed digital versions of central bank issued currencies, stablecoins are privately-issued digital currencies designed to maintain a stable value often by pegging to other assets.

Stablecoins combine the benefits of fiat currencies with the programmability of blockchain technology, addressing key challenges in the global digital economy. They have diverse applications, including supporting digitally native markets, facilitating payments, empowering decentralised finance (DeFi) services, and more.

Stablecoins reached a market capitalisation of USD\$180 billion in 2022 and today they represent around 10% of the digital assets market with a cumulative volume of more than USD\$7 trillion from the beginning of 2023.¹

While stablecoins may have been born out of the need for digital asset users to find a less volatile home during times of instability, they have become and are continuing to become a more significant part of the digitally native world. As adoption increases and use cases continue to evolve, it will be important for enterprises to take stock of, not only stablecoins, but all forms of digital money.

...with increased regulatory scrutiny and oversight on the horizon.

Looking ahead, stablecoins have the potential to foster inclusive financial systems² and drive innovation in tokenized markets and web3. However, stablecoin arrangements face challenges, including regulatory uncertainties and scalability concerns.

Global regulators are maturing their oversight of stablecoins (and broader digital assets), with specific examples illustrating the emergence of a regulated dual banking system for traditional and digital assets. Notable developments include the New York Department of Financial Services guidance for US dollar-backed stablecoins, updates in accounting standards by the American Institute of Certified Public Accountants, Singapore's stablecoin legislation, the European Union Markets in Crypto Asset Regulation's cross-jurisdictional framework, and the UK's expansion of regulatory coverage for fiat-backed stablecoins.

These initiatives signify a growing understanding of digital assets in the global banking system and provide regulatory clarity for various aspects of digital asset issuance and management. We expect ongoing evolution in these regulatory policies, as digital assets continue to shape the financial landscape.

For detailed jurisdiction-specific insights, please refer to *Navigating the Global Crypto Landscape with PwC: 2024 Outlook*, published in December 2023.



¹Source: CoinGecko (<https://www.coingecko.com/>), September 2023.

²PwC, *Blockchain's impact in fostering global financial inclusion*, September 2023.

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PwC Global CBDC Index



CBDC index research methodology

Index composition

The objective of the maturity index is to provide an overview of the development of CBDC globally.

The primary variable is the CBDC project status, indicating the current stage of project development. Two other variables capture the stance of the central bank based on published speeches, and a public interest proxy (Google Trends or Baidu Index).

This index is technology agnostic: the design choice (infrastructure, technologies, etc.) adopted by the country has no impact on the index.

Composition rationale (index ranking)

The 2023 index excludes live and near-live CBDC projects (defined in this report as advanced, long-term consumer pilot projects): Nigeria, the Bahamas, Jamaica, Eastern Caribbean and Mainland China. For others, we analysed the following aspects of the indicators introduced by the Bank for International Settlement (BIS), based on the data update release in July 2023.

CBDC project status - representing 75% of the CBDC index

CBDC project status tracks three stages of development – namely, research, pilot and production. Given the increasing trend of CBDC projects entering into pilot phases, we have introduced detailed development stages for the pilot phase (i.e. proof-of-concept, development, implementation, completion and near-live). The more advanced a CBDC project is, the higher score it receives. In addition, points are allocated, based on the duration of the corresponding pilot projects, to simulate the project progress. However, these points can be withdrawn if a pilot project did not have new developments for several years or if the central bank no longer focuses on the project.

CBDC speech bank - representing 17% of the CBDC index

Central bank speech stance measures the recent average opinion expressed by central bankers, captured within the BIS central bankers' speeches databases. This indicator aims to provide information about the future of the project status and legal aspects.

Public interest proxy - representing 8% of the CBDC index

Public interest proxy is the average score of Google Trends (for projects outside Mainland China) and Baidu Index (for Mainland China only) during the recent periods. It represents recent trends of general public interest. It suggests potential collaborative interest from private sectors, who could support future project advancement.

Data source

BIS¹, Central Bank websites, Atlantic Council, Press, Central Banks, Google Trends, Baidu Index and PwC Analysis.

Quality review

PwC has made extensive use of the BIS data, and subjected the analysis to several rounds of review prior to publication. A quality review is performed on index distribution and ranking changes to evaluate data robustness.

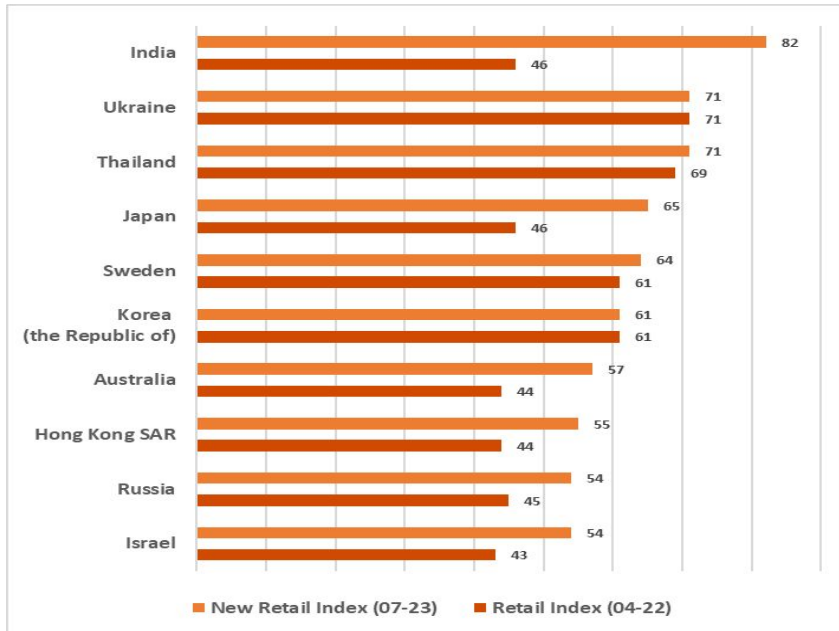
¹BIS, Rise of the central bank digital currencies: drivers, approaches and technologies, BIS working paper, No 880, August 2020 (updated July 2023), Auer, R, G Cornelli and J Frost



Top 10 retail CBDC projects

Retail CBDCs are intended for use by consumers and firms in everyday transactions.

Top 10 retail CBDC projects



Key insights

The 2023 CBDC maturity index excludes jurisdictions with live CBDC projects. Namely, **the Bahamas, Jamaica and Nigeria**. As well as near-live CBDC projects (defined in this report as advanced, long-term consumer pilots). Namely, **Eastern Caribbean and Mainland China**.

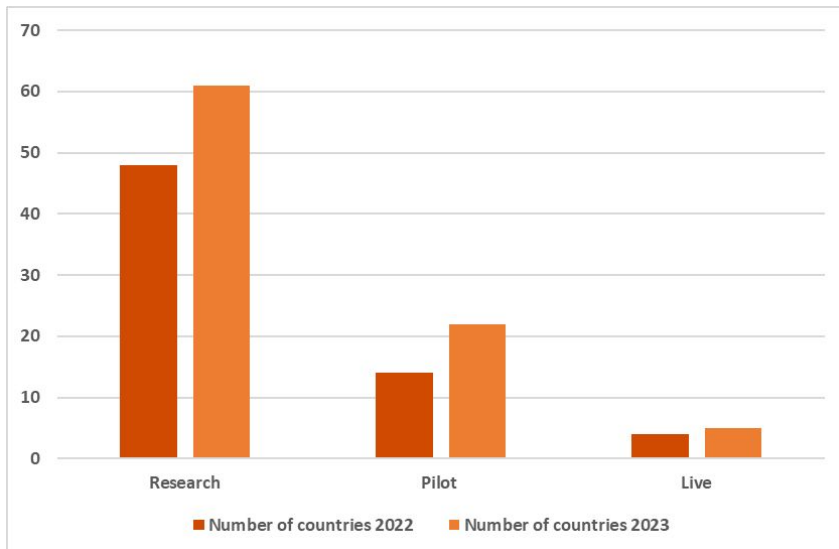
As a result, several new projects have emerged in the top 10.

India, Japan, Australia, Hong Kong SAR, Israel and Russia have progressed in research, testing and, in some cases, piloting their potential digital currencies.

While the central banks continue their diligent effort on the topic, out of the top 10, only India, Ukraine and Russia have so far formally announced their plans to launch a CBDC in the next few years.

The index should not be considered as the implementation order of the national CBDCs.

Retail CBDC progress 2022-2023



Key insights

Jamaica is the most recent country to issue a CBDC, Jam-Dex, in 2022.

21 new central banks are engaging in CBDC research in the 2023 index, compared to the 2022 index.

Eight new central banks started piloting potential CBDCs in the 2023 index, compared to the 2022 index. Including India, Singapore, Hong Kong SAR and Norway.

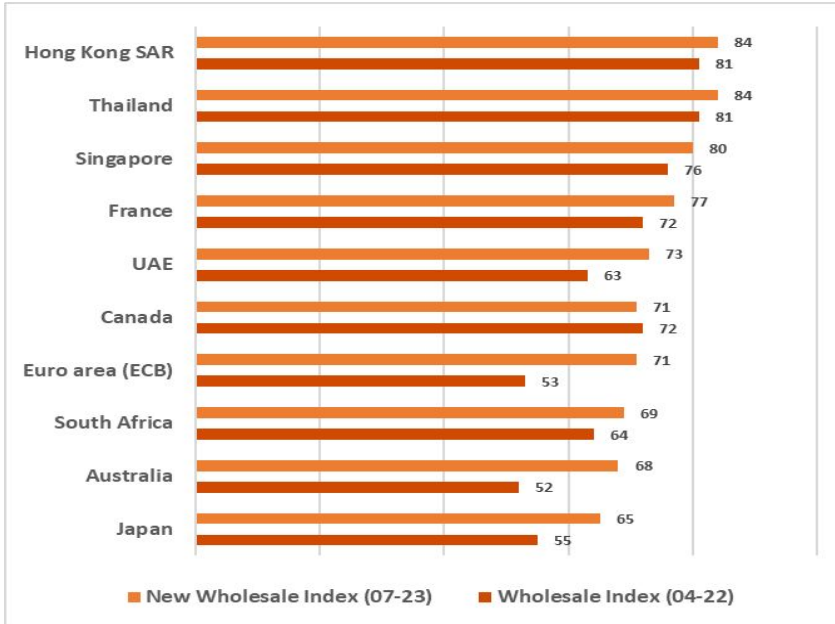
Section three of this report provides further details on individual CBDC projects around the world.

The index data is based on the BIS Working paper, No 880 (July 2023 update) and PwC analysis. The index relies on the availability of the BIS data. Therefore, the index value may differ from the actual country progress or intended implementation plans. Note: Uruguay has been removed from the 2023 index, as their CBDC project does not appear to have advanced in recent years.

Top 10 wholesale CBDC projects

Wholesale CBDCs are intended for use by central banks, private banks and other financial institutions. Sections three and four of this report provide further details on individual CBDC projects around the world.

Top 10 wholesale CBDC projects



Key insights

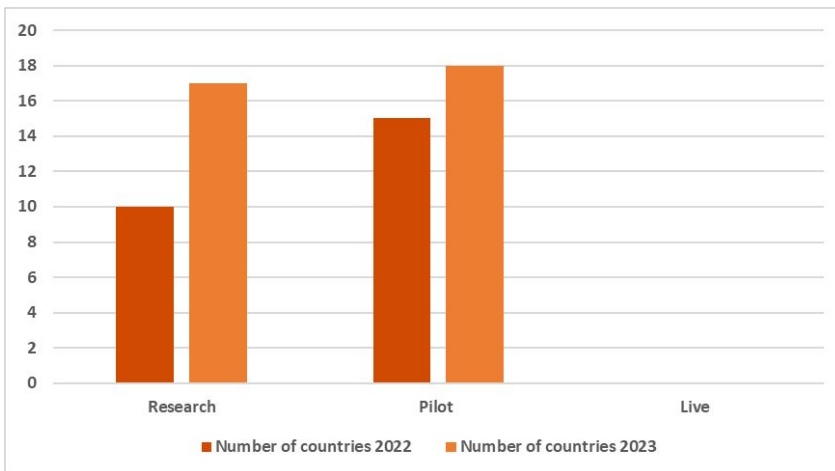
The work completed by the European Central Bank and Reserve Bank of Australia has secured them a top 10 spot in the 2023 maturity index.

Over the past 12 months, several central banks have completed further cross-border testing, often supported by the BIS, including Hong Kong SAR, Thailand, Singapore and the United Arab Emirates (UAE).

The Eurozone aligns with the experiment and concept validations drive, notably by intensifying testing within certain countries. The Banque de France has developed its own distributed ledger technology (DLT), called 'DL3S,' to assess its capabilities and adaptability in different use cases.

While Canada's search index has decreased by 1%, the project status remains unchanged.

Top 10 wholesale CBDC projects



Key insights

Seven new central banks are engaging in CBDC research in the 2023 index, compared to the 2022 index, including Colombia, Namibia and Tanzania.

Three new central banks started piloting potential CBDCs in the 2023 index, compared to the 2022 index, including Brazil and the Philippines.

While wholesale CBDCs are often considered politically less controversial and technologically less challenging to implement than retail CBDCs, no central bank has so far issued a wholesale CBDC.

Section three of this report provides further details on individual CBDC projects around the world.

The index data is based on the BIS Working paper, No 880 (July 2023 update) and PwC analysis. The index relies on the availability of the BIS data. Therefore, the index value may differ from the actual country progress or intended implementation plans.

2

Stablecoin overview



What is a Stablecoin

Stablecoins represent units of value designed to maintain a steady valuation in relation to fiat currencies or other assets, including cryptocurrencies. Price stability can be achieved through either the use of reserve assets (collateralisation), or algorithms that dynamically balance supply and demand (typical of algorithmic stablecoins).

Advantages and challenges

Stablecoins offer the advantages of fiat currencies - serving as a store of value, medium of exchange, and unit of account - **whilst operating on blockchain technology**. This blockchain foundation endows them with programmable capabilities, enabling seamless interaction with digital assets and decentralised networks.

In the context of our increasingly global (digital) economy, stablecoins **address key challenges in the financial landscape**:

1. Eliminating the need for multiple international bank accounts, allowing users to transact internationally with a single crypto wallet.
2. Enabling direct, peer-to-peer digital transactions without the involvement of intermediaries.
3. Providing 24/7/365 availability for settlement, in contrast to traditional banks with fixed operational hours.

Stablecoins aim to reduce fees, transfer times, and privacy concerns often associated with central banking practices.

Applications

The applications of stablecoins span various domains:

1. **Supporting digitally native markets:** These coins facilitate trading digital assets and serve as a bridge between fiat currencies and blockchain-recorded digital assets, offering stability in contrast to volatile cryptocurrencies.
2. **Facilitating payments:** Stablecoins expedite peer-to-peer and cross-border payments, presenting opportunities for innovative payment solutions through programmable money.
 - **Remittances:** Offering a cost-effective solution for overseas workers sending money home.
 - **Internal transfers and liquidity management:** Streamlining fund transfers within organizations and across subsidiaries.
 - **Payroll:** Simplifying financial management for globally dispersed workforces while reducing international transaction fees.
 - **Escrow:** Automating escrow processes via smart contracts, bypassing institutional intermediaries.
 - **Retail businesses:** Retailers can benefit from lower transaction fees by accepting stablecoins as payment.
3. **DeFi (Decentralised Finance):** Stablecoins underpin various DeFi services, including market making, collateralized lending, derivatives, and asset management, and providing attractive lending opportunities while bolstering decentralised application ecosystems.

Challenges

However, despite these merits, stablecoins face certain challenges:

1. **Transaction speeds** vary across blockchains,
2. **Inconsistent transaction costs**, influenced by factors like network congestion.
3. Transitioning to newer blockchain technologies to address scalability and efficiency issues may compromise decentralisation.
4. Ongoing concerns about the **financial stability risks** posed by the growing stablecoin market.

Potential

Looking ahead, stablecoins hold the potential to drive innovation across diverse domains:

1. **More inclusive payment and financial systems:** By facilitating faster, cheaper payments, stablecoins can reduce barriers, especially for cross-border transfers.
2. **Tokenized financial markets:** Stablecoins can play a pivotal role in digitising traditional securities and enhancing market efficiency.
3. **Next-generation innovations like Web3:** Stablecoins may support microtransactions within decentralised networks, transforming online services.

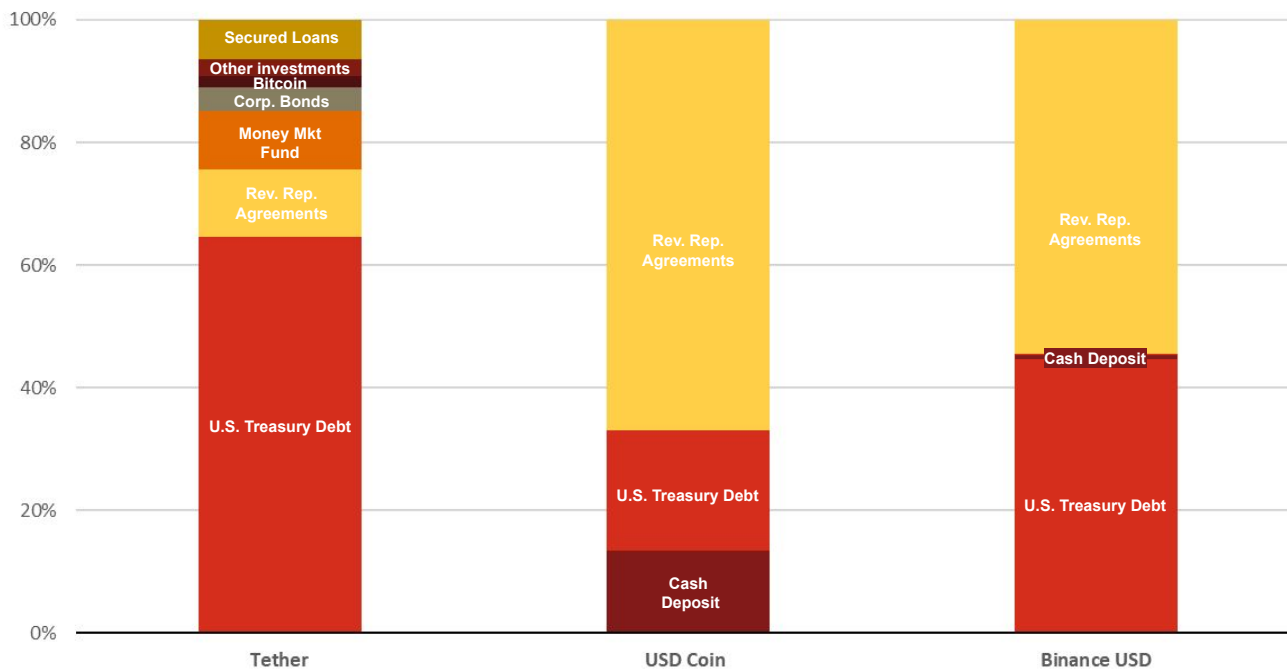
While stablecoins currently find substantial utility in cryptocurrency trading and DeFi, **their future growth prospects extend to fostering more inclusive financial systems, revolutionising tokenized financial markets, and supporting the evolution of digital money.**

Types of Stablecoins

Types of stablecoins

Classification	Pegged to
Fiat-backed	Fully backed by cash or liquid assets. Redeemable by the issuer at face value. Reserves are normally maintained by regulated entities. May provide a higher level of transparency, such as detailed attestation disclosures on reserve assets and clear documentation of redemption rights.
Security-backed	Fully backed by non-cash equivalent assets (e.g. corporate bonds, commercial paper). In some cases, some issuers may be able to defer redemption, offer in-kind redemption, or impose higher redemption fees.
Crypto-backed	Backed by other crypto assets and/or algorithmic protocols which increase or decrease the supply of tokens according to market conditions. Typically structured on a decentralised, non-custodial basis and are considered part of decentralised finance (DeFi).
Other asset-backed	For example, by commodities (such as gold) or non-fungible tokens (NFTs)

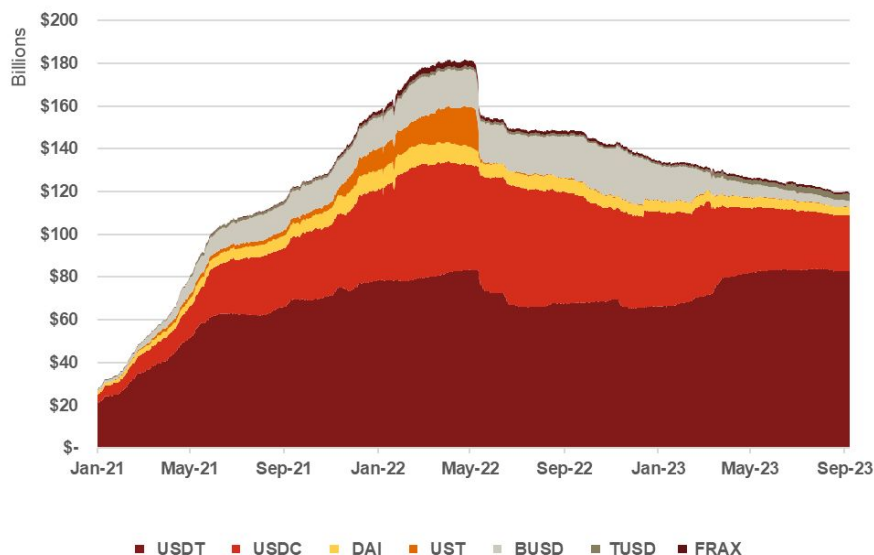
Example distribution of assets held as reserves



Data sources: Stablecoin website and attestations, 5 September, 2023. All information is subject to change

How the landscape evolved over the past year

Market Capitalization of top seven stablecoins

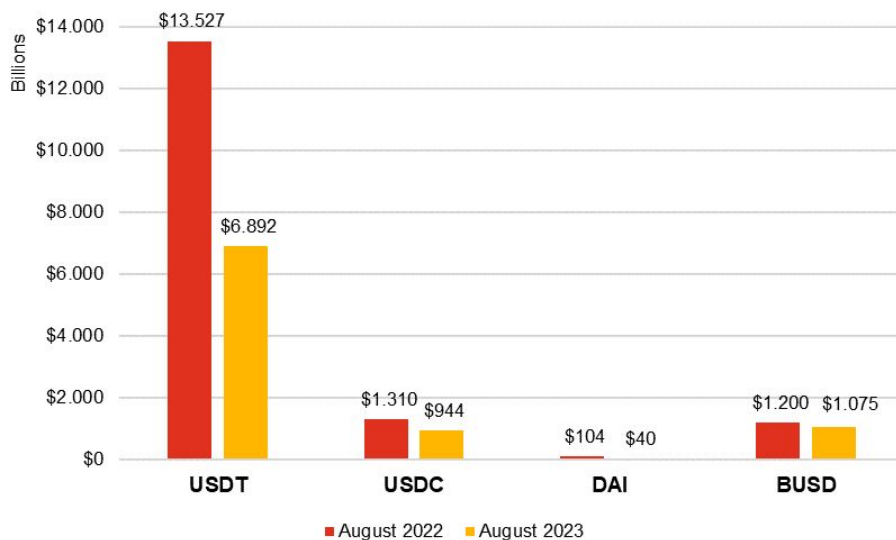


Key insights

May 2022 represented a turning point in the stablecoin market.

The UST de-peg highlighted the importance of sound economic stablecoin design and caused a loss of confidence in algorithmic backed arrangements. Following the UST collapse, global regulators seek to define clear requirements and oversight mechanisms for stablecoin. Following suit, the market capitalization of the stablecoin sector decreased, but remains promising market given expected regulatory clarity (e.g. MiCAR).

Cumulative Volume (beginning of the year until end of August 2022-2023)



Key insights

Despite the significant decline in the volume of USDT, mostly due to the decrease in the overall crypto volume that characterises periods of bear market, the stablecoin remains the biggest player both in terms of market share and volumes.

In 2023, USDC and BUSD maintained a cumulative volume similar to the same period of last year.

BUSD cumulative volume decreased as compared to last year due in part to the announcement of Paxos' official support ending in 2024¹.

Private alternative form of digital money

In respect to last year it is worth mentioning the increasing interest in deposit token by financial institutions which are looking for an alternative form of privately issued form of digital form of money in respect to stablecoin. Deposit token are backed by a financial institution balance sheet and they are the blockchain based representation of existing bank deposits and follows the reserves requirements of commercial bank money. Their development can be seen as the legacy banking sector response to an increasing stablecoins market which have highlighted demand for such instruments.

Data sources: CoinGecko (<https://www.coingecko.com/>), 5 September 2023.

¹Paxos: Paxos Will Halt Minting New BUSD Tokens, 13 February 2023.

All information is subject to change.

Select Stablecoin Overviews 1/2

	Tether	USD Coin	DAI
Rank by Market Cap (Change from last year)	1st ▲▼ -	2nd ▲▼ -	3rd ▲ +2
First Issuance	2014	2018	2019
Currency Peg	USD	USD	USD
Legal Entity	Tether Holdings limited; British Virgin Islands	Circle Internet Financial, LLC; United States	Maker DAO; United States
Classification	Fiat, securities, other assets, crypto	Fiat, securities	Crypto, securities
Regulatory Oversight	None found	UK: E-Money Issuer License US: Sale of Checks and Money Transmitters Singapore: Major Payment Institution License	None found
Reserve Reports	Quarterly assurance opinions provided by a third party. https://tether.to/en/transparency/ #reports	Monthly examination reports provided by a third party. https://www.circle.com/en/tra nsparency	None found



Data sources: CoinGecko (<https://www.coingecko.com/>), stablecoin website and attestations, 5 September 2023.
All information is subject to change.

Select Stablecoin Overviews 2/2

	TrueUSD	Binance USD	Frax
Rank by Market Cap (Change from last year)	4th ▲ +2	5th ▼ -2	6th ▲▼ n.a.
First Issuance	2018	2019	2019
Currency Peg	USD	USD	USD
Legal Entity	Techteryx, Ltd; British Virgin Islands	Paxos Trust Company LCC; United States (for ERC20 only)	Frax Finance; Cayman Islands
Classification	Fiat, securities	Fiat, securities	Backed partially by collateralised crypto and partially stabilised algorithmically
Regulatory Oversight	None found	Regulated by New York State Department of Financial Services (for ERC20 only)	None found
Reserve Reports	Real time reports provided by a third party (does not provide reserves distribution details). https://tusd.io/transparency	Monthly examination of management assertions reports provided by a third party (for ERC20 only). https://paxos.com/busd-transparency/	None found



Data sources: CoinGecko (<https://www.coingecko.com/>), stablecoin website and attestations, 5 September 2023. All information is subject to change.

Future of stablecoins and regulatory expectations

While the broader global regulatory landscape explores uncharted and potentially precarious territories, policymakers have demonstrated an enhanced understanding of digital assets. These global standard-setters (including the Financial Stability Board, Basel Committee on Banking Supervision, International Organization of Securities Commissions and Committee on Payments and Market Infrastructures, and the Financial Action Task Force) have embarked on the journey of establishing a comprehensive range of regulatory oversight capabilities for these assets - with the expectation that national authorities build on the principles of "same activity, same risk, same regulation". Here are specific global examples of this maturation and the emergence of a regulated dual banking system capable of managing the entire life cycle of digital assets alongside traditional assets.

NY DFS Guidance

Whilst US lawmakers deliberate over a federal framework for stablecoins, New York State continues to approve stablecoin issuances by its licensees and has published guidance setting standards for risk management and audit. The New York Department of Financial Services (DFS) has issued guidance on the issuance of US dollar-backed stablecoins, outlining specific requirements for stablecoins under its jurisdiction. This guidance was likely influenced by the market turmoil of the past year. It marks a significant development in the regulation of US dollar-backed stablecoins, being the first guidance from a state regulator. It is noteworthy because the DFS currently oversees the issuers of three of the six largest centralised dollar-backed stablecoins in circulation.

In support of the NY DFS guidance, the SEC (during the 2022 AICPA & CIMA Conference on Current SEC and PCAOB Developments) staff presented their views on accounting for Digital Asset lending. This prompted the AICPA to update its practice aid, "Accounting for and Auditing of Digital Assets", in February 2023, to align with these views. Subsequently, we witnessed several crypto miners making restatements related to their application of the impairment guidance on intangible assets in ASC 350.4.

Singapore Stablecoin Legislation

In August 2023, the Monetary Authority of Singapore (MAS) announced a new regulatory framework aimed at ensuring stability for regulated stablecoins in Singapore. This framework applies to single-currency stablecoins (SCS) pegged to the Singapore dollar or any G10 currency, including the US dollar, issued in Singapore. The "Stablecoin Issuance Service" becomes an additional payment service under the Payment Services Act 2019 (the PS Act). Non-SCS stablecoins will continue to be subject to the existing regulatory regime under the PS Act, which covers digital payment tokens and allows their issuance, use, and circulation within Singapore. The legislation includes key requirements related to reserve assets, asset segregation/custody, base capital/solvency, business restrictions, redemption, and guidance for SCS issued in multiple jurisdictions.

MiCA Regulation

In June 2023, the EU's Markets in Crypto-Assets Regulation (MiCA) entered into force, as newest addition to the EU's Single Rulebook. This new legislative and regulatory framework promotes user confidence in crypto-assets by reducing obstacles to the development of (also) a stablecoin market. Stablecoins, currency tokens and utility tokens will fall under the MiCA regime while security tokens and token-related derivatives are captured by currently applicable financial services legislation. crypto-asset issuers issuing stablecoins will be required to maintain 1:1 reserves to cover all claims and to satisfy redemption rights at all items. The European Central Bank may prohibit issuance of stablecoins if considered necessary. Under MiCAR, the stablecoin regime applies from June 2023, with a 12-month transitional period from its entry into force.

United Kingdom Stablecoin Legislation

The UK Government has made legislative changes to bring fiat-backed stablecoins, used for payments, into the regulatory perimeter. The changes also cover systemic payment systems and service providers. The immediate focus is on the regulation of issuers, custodians and payment service providers for fiat-backed stablecoins used for payments. Exchange and trading activities will be captured in phase 2. The authorities and regulators are expected to consult on the specific rules in 2023.

These examples illustrate the maturation of global policy, embracing digital assets as integral to the global banking system. They provide regulatory oversight for aspects such as digital asset maintenance, issuance, wind-down, and enforcement. Looking ahead, we anticipate continued evolution in these emerging policies. For detailed jurisdiction-specific insights, please refer to Navigating the Global Crypto Landscape with PwC: 2024 Outlook, published in December 2023.

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Bahamas and Eastern Caribbean

The Bahamas: Sand Dollar

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - live, Wholesale CBDC - n/a

Key developments: In October 2020, the Bahamas became the first country to launch a CBDC, the sand dollar.

Its objectives are to 1) enable more efficient payments systems with more secure transactions and shorter settlement times, 2) enhance financial inclusion and wider access, 3) reduced payment costs, and 4) create stronger controls around anti-money laundering, anti-counterfeiting and other illicit activities.

Nearly three years on, spending in sand dollars remains low compared to the overall size of the domestic payments system, but is increasing as a result of technology improvements and outreach efforts.

In August 2023, there were over \$1,076,000 sand dollars in circulation. C. 15% of sand dollars were circulated to consumers through promotional programmes. Overall, the Central Bank of the Bahamas targets to give away \$1 million sand dollars to early adopters by the end of 2024.¹

As of August 2023, c. 113,000 Bahamians had opened a sand dollar wallet and nearly 1,700 businesses had access to merchant services through the Central Bank licensed payment services providers.¹

During 2023, the Central Bank has conducted a number of technical changes to improve user experience, wallet and payments functionality and interoperability between commercial banks, including a two-way linkage between the banking system, through the Automated Clearing House.

The Central Bank has also adopted other outreach activities to increase the sand dollar adoption, including targeted consumer and merchant education as well as promotional campaigns through merchant and events partners.

At the November 2022 Digital Euro conference, the Governor of the Central Bank shared four key lessons to jurisdictions intending to issue a CBDC.²

1. Expanding the merchant network is important to accelerated adoption.
2. Interoperability with the traditional banking system is crucial for merchants, who need to treat CBDC revenue like any other form of receipt.
3. Central banks should enlist participation from the traditional banking sector and credit unions.
4. User education is important. This messaging is being crafted to inspire user confidence, especially around data protection, cybersecurity, and ease of use.

Next steps: The Central Bank continues to engage with consumers and businesses to increase the sand dollar and other e-money use.

Further information: ¹Central Bank of the Bahamas: Public Update on The Bahamas Digital Currency Sand Dollar, 8 September 2023, and other Public Updates since March 2023, ²The Digital Euro Conference: Bahamas' Experience with the Sand Dollar, 7 November 2022.

Eastern Caribbean: DCash

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - near-live, Wholesale CBDC: n/a

Key Developments: In March 2021, the Eastern Caribbean Central Bank (ECCB) launched its DCash CBDC pilot project in four (4) of the eight Eastern Caribbean countries.

In January 2022, the use of the platform was temporarily halted as the ECCB performed security tests and undertook upgrades and enhancements on its platform.

As of September 2023 the project is in pilot phase in all eight Eastern Caribbean countries and is being used at selected merchants across Eastern Caribbean countries.

The Dcash consumer wallet and merchant applications are available to download from online stores.

Next Step: The ECCB will further increase the marketing and promotions around the DCash application.

Further information: The ECCB's designated webpage for DCash.



Jamaica and Nigeria

Jamaica: Jam-DEX

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - live, Wholesale CBDC - n/a

Key developments: The Bank of Jamaica (BOJ) implemented a phased roll-out of JAM-DEX in 2022, achieving several significant milestones during the first year.

In February 2022, the BOJ branded the CBDC as JAM-DEX with a distinctive logo, featuring the national fruit, ackee, and the tagline – ‘No cash, no problem’.

In June 2022 amendments to the BOJ Act were enacted designating the Bank as the sole authority to issue CBDC.

National Commercial Bank Jamaica Limited (NCB) was issued JAM-DEX amounting to JMD\$250 million to facilitate the incentivisation programme announced in March 2022 budget, where the first 100,000 customers received JMD\$2,500 in JAM-DEX for opening wallets.

In December 2022, JN Bank Limited became the second deposit-taking Institutions (DTI) onboarded as a wallet provider to distribute JAM-DEX. JN Bank received digital currency valued at JMD\$1.0 million.

JAM-DEX was successfully utilised in the Government's Employment Generation Programme in December 2022. Over JMD\$600,000.00 in JAM-DEX financed the short-term employment of workers fostering transactions between workers and small merchants who were also wallet holders. The success highlighted JAM-DEX as a safe, convenient and secure digital payment option, promoting financial inclusion.

By the end of 2022, the Bank minted JAM-DEX amounting to JMD\$276.0 million. Of this sum, JMD\$230 million was minted in 2021, while JMD\$46.0 million was minted in 2022.

Of the JAM-DEX minted in 2022, JMD\$26.0 million was issued to NCB and JMD\$1.0 million to JN Bank Limited. The remaining JMD\$19.0 million is stored in BOJ's digital vault.

During the year, NCB onboarded over 3,900 small merchants and over 180,000 regular customers who can conduct transactions using JAM-DEX.

JAM-DEX currently has 250,000 thousand users which accounts for 8.3% of the population. As at 23 August 2023, the BOJ reported JMD\$257.0 million CBDC in circulation.¹

Next Steps: The BOJ plans to sustain efforts in promoting JAM-DEX as a means of payment for other Government initiatives in 2023.

Further information: Bank of Jamaica: Annual Report and Financial Statements for the year ended 31 December 2022, p. 60-61. ISSN 0067 3668, Bank of Jamaica Balance Sheet as at 20 August 2023.¹

Nigeria: eNaira

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - live, Wholesale CBDC - n/a

Key developments: In October 2021, Nigeria became the first country in Africa and second country in the world to launch a fully public CBDC, eNaira. The Central Bank of Nigeria's (CBN) ambition is to transform the predominantly cash economy into 100% cashless economy.

The drivers for eNaira are to increase financial inclusion, facilitate cheaper cross-border remittance and reduce informal payments. Nigeria has adopted a two-tiered system for its CBDC: the central bank is responsible for issuing eNaira, while it leverages the existing financial system and actors, using a phased approach, to distribute and facilitate the CBDC payments.

One year after the phase 1 launch, there were less than 860,000 retail wallet downloads, equating to 0.8 percent of Nigeria's active bank accounts, according to the International Monetary Fund. 98.5 percent of wallets were inactive in any given week.¹

During 2023, the CBN has expanded the access to eNaira to include those without bank accounts or internet access, onboarded revenue collection agencies and actively promoted the CBDC through business collaborations and public PR campaigns.

Perhaps most crucially, the CBN has also set cash withdrawal limits to support central bank and private sector digital payments, as well as made welfare payments using eNaira.

According to the CBN, 18 months after the launch, over 13 million wallets were recorded across all CBDC users. 30% were created especially for social intervention payments. Transactions had increased 68% to N22 billion and N3.429 billion eNairas were in circulation.²

In June 2023, the CBN approved eNaira for diaspora remittance. International money transfer operators (IMTO) will be required to open merchant wallets through the CBN and pre-fund the CBN account with foreign currency. The Bank will refund the IMTO merchant wallet with eNaira. The use of eNaira remains optional and runs concurrently with the dollar payout.³

Next steps: The CBN's sticks and carrots have ensured an increased eNaira adoption. The next few years will indicate whether Nigeria will be able to create enough user incentives for a mass adoption.

Further information: ¹IMF: Nigeria's eNaira, one year after, Jookyung Ree, May 2023, p. 11-12, ²CBN: Update ISSN No: 2695-2394, Vol. 5, No. 3 March 2023, p. 9, ³ISSN No: 2695-2394 Vol. 5 No. 6 June 2023, p. 5.

Mainland China

Mainland China: Digital Yuan

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - near-live, Wholesale CBDC - no. 14

Key developments: Since the launch of the e-CNY pilot in late 2019, the number of participating locations has been steadily extended to cover 26 locations across 17 provinces.

As of the end of June 2023, the number of e-CNY transactions reached 950 million, amounting to CNY1.8 trillion. E-CNY in circulation in Mainland China reached CNY 16.5 billion, although representing only 0.16% of Mainland China's cash in circulation. 120 million wallets were set up.¹

During 2023 the central bank and participating institutions continued to explore practical applications of e-CNY, enabling further innovation. Some of the key use case scenarios include:

- purchase of financial products using e-CNY;²
- raising funds in e-CNY, in relation to a corporate bond (CNY750m) issuance;³
- salaries payments at a number of public sector entities;⁴
- pilot on cross-border e-CNY usage, where visitors from Mainland China are able to use e-CNY at retail outlets in Hong Kong SAR; and
- launch of special hardware wallets for major international sporting events.⁵

In addition to retail usage, there have been cross-industry and cross-jurisdiction collaboration to promote the use of e-CNY, for example:

- several major banks collaborated with telecom operators to launch SIM card based hardware wallet with NFC capability.
- collaboration with branches of overseas banks in China to enable corporate clients of the bank to collect payments from their customers in e-CNY, enhancing efficiency and enabling reconciliation by providing consolidated merchant reports with itemised e-CNY transactions via the bank's digital banking platform.
- a special initiative focused on enabling Hong Kong SAR citizens to obtain e-CNY hardware wallet (via a hard wallet self-service machine) and local funds using a Hong Kong SAR's stored value facility.

On a technology level, the enabling components are continued being enhanced, with a new version of the wallet application being launched that incorporate the ability that enables overseas users to "pre-load" their wallets using credit cards, as well as other features for settling utilities bills, making tax payments, and interface with shopping apps. More significantly, smart contract usage have been extensively explored, including functions such as "fund custodianship" to enable automatic conditional payment to specific payee (e.g. service provider; subsidies, loan drawdown, etc.) to reduce risk of "prepayment", protect consumers, and enforce dedicated use of funds (such as in the context of subsidies).⁶

The adoption of Near Field Communication (NFC) technology for hardware e-CNY wallets enabled users to transact using their device even when both transacting parties are not connected to any telecommunication/wifi network.

Next steps:

China continues to expand on pilots for potential use cases for the e-CNY exploring practical applications and collaborating cross-industry as well as cross-jurisdiction.

Further information:

¹ Ministry of Commerce of The Peoples Republic of China: China's central bank governor Yi Gang says digital yuan transaction in China is gaining momentum, 21 July 2023. (in Chinese).

² China Securities Journal: Soochow Securities takes lead in Launching e-CNY application in Securities sector, 16 January 2023. (in Chinese).

³ Nantong Government website: New scenario for e-CNY application! Qidong City sees first corporate bond to raise funds using e-CNY, 24 August 2023 (in Chinese).

⁴ News.cn : Paying Salaries using Digital RMB – What is the experience? 25 Apr 2023 (in Chinese).

⁵ Hangzhou 2023 Asian Games website: E-CNY hardware wallets to surprise users at Hangzhou Asian Games, 26 April 2023.

⁶ PBoC Suzhou Branch: The People's Bank of China Suzhou Branch actively promotes the use of e-CNY smart contracts in multiple fields, 13 September 2023 (in Chinese).



India and Ukraine

India: Digital Rupee

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - no. 1, Wholesale CBDC - no. 10-20

Retail CBDC: The Reserve Bank of India (RBI) launched the pilot for the retail CBDC, the Digital Rupee or e₹, in December 2022. The key driver for the project is the shift in the global payments landscape, including the growth of private digital currencies, and the vast majority of global central banks exploring potential CBDCs.

Within India, the high use of cash is marked by the high operational costs and risks associated with the physical cash are driving the plans to issue a CBDC. A digital form of cash will not only counter these risks, but could also boost innovation across the payments sector and increase financial inclusion.

The RBI will issue the digital rupee as an intermediary model token on Hyperledger DLT. Intermediaries (commercial banks) perform distribution on an application programming interface (API) based platform, leveraging support from fintech solution providers.

The participating banks are identifying commercially viable business models and use cases with the support of fintech solutions. National Payments Corporation of India (NPCI) is playing the role of switching between participants, interoperability with Unified Payments Interface (UPI), and ensuring uniform technology specifications.

As of October 2023, two use cases are live in the pilot, namely Person to Person (P2P) and Person to Merchant (P2M) payments. As of June 2023, the pilot had reached a million individuals and around 262,000 merchants. 13 banks are participating in the pilot implementation, with an average of 18,000 transactions per day.¹

Next steps: The retail CBDC is expected go live in 2024.

The RBI and market participants are scaling the initial pilot and exploring new use cases under project Utkarsh 2.0, and conducting global hackathons for innovative solutions. Some significant use cases include: interoperability with UPI, offline capabilities and programmed Money.

Wholesale CBDC: The wholesale CBDC pilot also known as the digital rupee wholesale or e₹-W, and was launched as a pilot in November 2022. The wholesale CBDC is account-based and, at least initially, used only for the settlement of secondary market transactions in government securities.

Between November 1 and 7 the pilot witnessed volumes in the range of \$31.36Mn to \$63.91Mn daily. It offers several benefits such as reduced transaction costs, settlement time, and settlement risk.²

Next steps: Potential future use cases for the wholesale CBDC include: cross-border remittance, interbank borrowing/call money market and credit facilities.

Further information: RBI: Concept Note on Central Bank Digital Currency, October 2022, PwC India: Future of digital currency in India, August 2023.

¹Fitch Wire: India's Retail Central Bank Digital Currency Project Makes Headway, 25 July 2023.

²Forbes India: Digital currencies: Why the RBI needs to bite the bullet, Salil Panchal, 8 November 2022.

Ukraine: E-hryvnia

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - no. 2, Wholesale CBDC - n/a

Key developments: The National Bank of Ukraine (NBU) has accelerated its retail CBDC development efforts.

The key reasons for the NBU to issue a CBDC include:

- develop the Ukrainian payment infrastructure;
- digitalise the economy;
- further promote and reduce the price of non-cash payments;
- improve transparency of settlements; and
- ensure confidence in the domestic currency in general.

In October 2022, the Ukrainian Intellectual Property Institute (Ukrpatent) registered the trademark “e-гривня” (the Ukrainian for “e-hryvnia”) with the NBU.

In November 2022, the NBU presented to banks and non-bank financial institutions a concept of the e-hryvnia, including possible design of the CBDC, its architecture, features, and advantages for payment service providers.

Currently, the NBU is considering the following possible options for using the e-hryvnia which will be factored into its design and main features:

- Retail non-cash payments with the possible use as “programmed” money: for paying out targeted social benefits, reducing government spending on the administration and control of the targeted use of funds, and using smart contracts technology to program various settlement logic models, depending on specific circumstances or facts.
- Circulation of virtual assets (for instance, in the exchange and issuance of virtual assets, and in other transactions with these assets). The e-hryvnia can become one of the key elements of the development of quality infrastructure for virtual assets in Ukraine.
- Provision of possibilities for cross-border payments: to expedite them, cut their costs, and increase their transparency.

Next steps: In its newly introduced strategy, the NBU declared its focus on adopting a clear regulation of e-hryvnia to ensure monetary sovereignty.

The action plan includes conducting a pilot project on the issuance and testing of e-hryvnia and making a decision on the feasibility of its large-scale issuance.

Further information: The NBU's designated web page on Central Bank Digital Currency.

Thailand and Japan

Thailand: Project Bang Khun Prom

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - no. 3, Wholesale CBDC - no. 2

Key developments: The Bank of Thailand (BOT) is actively involved in the retail and wholesale CBDC development, but has not made a decision to issue a digital currency.

The BOT's retail project, Bang Khun Prom, is in a pilot phase. With the CBDC, the BOT aims to enhance the payment system, promote efficiency and support innovation. The project assessed the effectiveness and safety of a CBDC without affecting the overall financial stability.

The retail pilot, which lasted until Q3 2023, allowed limited public CBDC use for payments and involved selected private sector partners and approximately 10,000 consumers. The project aimed to explore CBDC's potential and improve financial services. The BOT plans to continue with testing and pilots in the future.

The Bank of Thailand (BOT) is also involved in multi-banking wholesale CBDC project: Multiple CBDC Bridge Project or mBridge Project.

Phase 2 demonstrated the feasibility of a wholesale CBDC platform between Thailand and Hong Kong SAR, using DLT, improving international transfers and foreign exchange operations.

Phase 3 (mBridge) expands this project to include the Digital Currency Institute of the People's Bank of China and the Central Bank of the United Arab Emirates, with support from the BIS Innovation Hub Hong Kong Centre, aiming to create a multi-currency cross-border payments platform.

The mBridge Project will address limitations, including privacy controls, liquidity management, scalability, and compliance with regulations, with potential future experiments involving commercial banks and market participants. The BOT recognises the importance of CBDC as a modern financial infrastructure and plans to conduct a retail CBDC pilot to assess its technology and design. This pilot will have two tracks: 1) the foundation track, which tests CBDC in limited retail transactions with selected partners, and 2) the Innovation track, which encourages innovative CBDC use cases. The BOT emphasises that there are no immediate plans to issue Retail CBDC, as thorough considerations are required.

The BOT, along with other central banks, completed a successful pilot project, utilising wholesale CBDCs for cross-border payments. This pilot, involving 20 commercial banks across four jurisdictions, demonstrated faster cross-border transactions, direct bank-to-bank connections, potential cost savings, reduced settlement risk, and support for local currencies in international payments. Future plans for mBridge include technology improvements, additional features, and policy considerations, with potential experiments in real-world settings.

Next steps: The BOT does not have any immediate plans to launch a digital currency.

Further information: The BOT's designated web page for central bank digital currency.

Japan: Digital Yen

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - no. 4, Wholesale CBDC - no. 10

Key developments: The Bank of Japan (BOJ) is developing both retail and wholesale CBDC, but has not made a decision to launch a CBDC.

In order to ensure the stability and efficiency of the overall payment and settlement systems, the BOJ considers it important to prepare thoroughly to respond to changes in circumstances in an appropriate manner.

For the retail digital yen, the BOJ has completed two phases of proof of concept work, the second phase ending in Q1 2023. The project built upon the scope of phase 1 and evaluated additional functions, confirming technical issues, including limits on holdings, # of transactions, multiple accounts and batch processing.

In July 2023, the BOJ established a CBDC forum to gather information and feedback regarding CBDC issues from banks, payment processors and telecommunications companies. The BOJ plans to continue with retail CBDC pilot programmes.

The BOJ has also been an active participant in global wholesale project discussions and experiments, including project Stella with the European Central Bank.

Other related developments include the Financial Services Authority (FSA) of Japan and the Monetary Authority of Singapore (MAS) announcing the participation of the FSA in Project Guardian, a collaborative initiative with the financial industry on digital assets established by MAS in May 2022, in an observer capacity in accordance with the Co-operation Framework to enhance FinTech linkages.

Next steps: The BOJ continues to engage in both retail and wholesale CBDC experiments.

Further information: The Bank of Japan's designated web page for the Digital Yen (Japanese and English available).



Sweden and South Korea

Sweden: Project E-krona

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - no. 5, Wholesale CBDC - n/a

Key developments: The Swedish Central Bank (SCB) has an on-going initiative investigating whether it is possible to issue a digital supplement to cash, the e-krona.

By providing an e-krona, the SCB could give actors other than banks direct access to an alternative payment infrastructure where they can offer payment services to their customers. This can make it easier for smaller and new actors to develop new innovative solutions and products.

In March 2023, the SCB's e-krona project finished its third phase, and released its third report. The report reviews how the e-krona could function if the SCB decides to issue the CBDC. The focus during the third phase was to:

- investigate how the SCB could cooperate with other actors in the payment sector to give the public access to and the opportunity to pay with e-krona.
- how conditional payments can be designed, and
- whether digital central bank money can simplify cross-border payments.

The report discusses the needed of different levels of governance, depending on cooperation with the wider payment system. Lower level of governance would allow payment service providers greater freedom to design services and interfaces to the public. Additionally, it could promote competition. A more stringent and higher level of governance would require participants to follow predefined and uniform interfaces and service offerings, but could ensure easier application and acceptance, due to its uniformity.

The e-krona project has also participated in a collaborative project with the Bank of Israel, the Central Bank of Norway and the BIS, called Project Icebreaker. The project aims to investigate whether CBDCs could simplify cross-border payments, which are often expensive and complicated.

Next steps: No formal decision regarding the issuance of an e-krona has been made. The SCB says it needs to conduct in-depth dialogues with the actors in the payment sector; who the SCB in the future could have collaboration with.

Going forward, the SCB's work will focus less on continued technical tests of the specific pilot solution, and more focus on investigating the conceptual design of an e-krona. This, before any decision on a possible issuance. Additionally, the SCB is following international development of CBDCs.

Further information: The SCB's designated web page for the E-krona.

South Korea: CBDC Developments

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - no. 6, Wholesale CBDC - n/a

Key developments: The Bank of Korea (BOK) is conducting research and a series of experiments on possible forms and designs of a CBDC. The BOK has not decided whether to issue a CBDC and has not selected any specific model or design features.

The BOK has stated that the rise of BigTech and new payment service providers presents a series of policy implications to the BOK, in the context of its roles in ensuring the safety and efficiency of financial market infrastructures including payment systems.

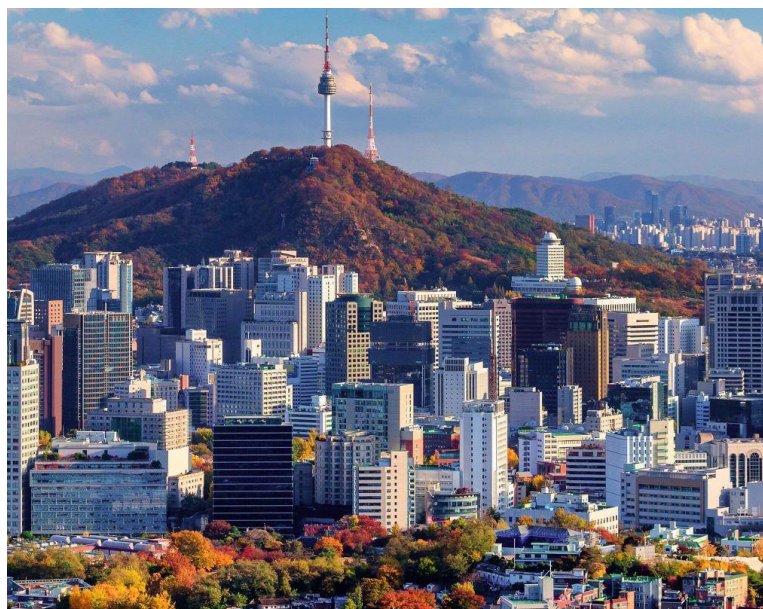
The BOK has therefore been undertaking a series of proof-of-concept experiments from August 2021 to June 2022 to test the feasibility of a CBDC on a digital ledger technology based platform. According to the BOK, the results showed that circulating a CBDC on a digital ledger technology based platform is technically feasible with a reasonable degree of stability and reliability.

Since the conclusion of the experiments the BOK has been undertaking extended proof-of-concept experiments in partnership with major commercial banks. The BOK is also considering conducting further research to explore more use cases and collecting additional technical information about CBDC circulation in new test environments.

Next steps: The BOK has identified the regions of Jeju, Busan and Incheon as candidates for a private target CBDC test bed.

The pilot project aims to explore the issuance and distribution of a CBDC, and the BOK plans to select one of the aforementioned regions for experimentation. The process will include testing payments and distribution at a public level and securing franchises that can accept payments via CBDC.

Further information: The BOK's designated webpage for the Central Bank Digital Currency.



Australia

Australia: Digital Dollar

The global CBDC project ranking, based on theBIS indicators:
Retail CBDC - no. 7, Wholesale CBDC - no. 9

Key developments: In August 2023, the Reserve Bank of Australia (RBA) and Digital Finance Cooperative Research Centre (DFCRC) released a joint report outlining the findings from a 12 month research project.

Under the project, the RBA invited industry participants to make use case submissions, identifying innovative business models, risks, benefits and operational models for a potential CBDC. The RBA received 160 industry submissions which covered a wide range of CBDC use cases which could potentially deliver benefits to Australian households and businesses. Four key themes emerged:

- smarter payments: enabling a range of complex payment arrangements;
- markets: supporting innovation in financial and other asset markets;
- digital money: promoting private digital money innovation; and
- inclusion and resilience: enhancing resilience and inclusion in the digital economy.

16 use cases were selected by the RBA and DFCRC to participate in the pilot. The project provided an opportunity to further our understanding of some of the technological, legal and regulatory considerations associated with a CBDC.

The project highlighted a range of areas where tokenized money could add value, including facilitating programmable payments, atomic settlement in tokenized asset markets and offline payments as well as opportunities for a CBDC to support the development of new forms of privately-issued digital money (including tokenized bank deposits or CBDC-backed stable coins) which could address some of the business needs identified in the use case submissions. As a result, a CBDC could be viewed as an enabling complement to, rather than substitute for, private sector innovation.

Alongside the transactional pilot, the project included an extensive industry consultation process. More than 50 companies and government departments were interviewed as part of this process.

Next steps: According to the RBA, considering the broader context – where the Australian payments system is currently meeting most of the needs of end users and work on CBDC in advanced economies is generally still in an exploratory stage – it is likely that any serious policy consideration of issuing a CBDC in Australia is still some years away.

The Government's Strategic Plan for the Payments System published in June 2023 indicated support for the Treasury and RBA continuing to explore the policy rationale for a CBDC in Australia. As part of this, the Treasury and RBA are planning to release a stock-take paper in mid-2024, outlining a forward looking plan on CBDC in the broader context of the future of digital money in Australia.

Further information: The RBA's designated web page on Central Bank Digital Currency.



Hong Kong SAR

Hong Kong SAR: e-HKD

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - no. 8, Wholesale CBDC - no. 1

Key developments: In September 2022, the Hong Kong Monetary Authority (HKMA, Hong Kong SAR's central banking institution) announced its policy stance and outlined the road map to issuing a retail CBDC, the e-HKD. The HKMA has previously undertaken two rounds of market consultation to examine the prospects of e-HKD issuance from both a technical and policy perspective

To pave the way towards the potential implementation of e-HKD, a three-rail approach has been outlined:

- Rail 1 aimed to establish the necessary technology and legal foundation to support the implementation of e-HKD, with a plan to also develop a wholesale CBDC layer that can interface with the two tier e-HKD system. Additionally, the HKMA is expected to assess areas requiring legislative amendments to enable the issuance of a digital form of fiat currency with legal tender status in Hong Kong SAR.
- Rail 2 is to run concurrently with Rail 1 and is focused on exploring use cases, addressing application, implementation, and design issues related to the e-HKD. The HKMA will conduct a series of pilots in collaboration with stakeholders to gain practical experience.
- Rail 3 focuses on the actual launch of e-HKD. It will integrate the findings from Rail 1 and Rail 2 to develop comprehensive implementation plans and determine the timeline for the introduction of e-HKD. The progress of Rail 3 will depend on the advancements made in Rail 1 and Rail 2, as well as the pace of relevant local and international market developments.

Subsequently, in October 2022, the HKMA reported on a six-week pilot they have conducted as part of their wholesale CBDC project - mBridge. The mBridge platform facilitated over 160 payment and foreign exchange transactions involving 20 banks across four jurisdictions and had a total of more than HK\$171 million being exchanged. This project represented one of the first multi-CBDC initiatives to successfully settle real-value cross-border transactions for corporate entities.

In October 2023, the HKMA published the "e-HKD Pilot Programme Phase 1 Report" to discuss the key findings, learnings, and the HKMA's assessment of 14 pilots conducted by the 16 participating firms under Phase 1 of the e-HKD Pilot Programme. The pilot included potential use cases such as fully fledged payments, programmable payments, offline payments, tokenised deposits, settlement of Web3 transactions, and settlement of tokenised assets. The results under Phase 1 showed that an e-HKD could add unique value to the current payment ecosystem in Hong Kong SAR in three main areas: programmability, tokenisation, and atomic settlement. However, the HKMA recognises that these pilots have been conducted on a small scale under a controlled environment. Further investigation and evaluation are required to determine if these benefits can be realised at a larger scale in real-life applications.

More recently, the HKMA, Bank for International Settlements Innovation Hub (BISIH) and the Bank of Israel (BOI) jointly published a report on Project Sela, in September 2023. The project was the first fintech collaboration between the two regulators and explored the technical viability of a retail CBDC with an architecture that can support non-bank payment intermediaries to directly connect to the central bank's CBDC ledger.

Next steps: The HKMA has not yet made a decision on whether and/or when to introduce an e-HKD. The outcomes and insights gained from Phase 1 of the e-HKD Pilot Programme will help enrich the HKMA's perspective and refine its approach to the possible implementation of e-HKD. The next phase of the programme will seek to explore new use cases for an e-HKD and delve deeper into select pilots from Phase 1. The HKMA also plans to establish a CBDC Expert Group to support HK Special Administrative Region's future exploration on key policy and technical issues surrounding CBDC, such as privacy protection, cybersecurity and interoperability.

Further information: Details can be found within the press releases and published reports on the HKMA's website under the CBDC category.



Russia and Israel

Russia: Digital Ruble

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - no. 9, Wholesale CBDC - n/a

Key developments: Russia has been working on a digital ruble project since 2020, but has accelerated the programme since it started a war in Ukraine.

The Bank of Russia (BoR) views the digital currency as a tool to combat fraudulent transactions and a way for the government to control payments made to social projects from state budgets.¹

The digital ruble is expected to be programmable, meaning that the BoR can control how and where the CBDC can be spent.

In July 2023, the country's President signed the digital ruble bill into a law (effective 1 August 2023) providing for the BoR to issue a CBDC.² In the same month, the BoR launched a pilot with 13 banks and a restricted group of their clients. 600 consumers in 11 cities have the opportunity to test the CBDC in 30 retail outlets. The first phase of the pilot also includes payments by QR code. The list of pilot participants (consumers and businesses) is expected to increase by the end of 2023.³

Next steps: The CBDC pilot will expand to include businesses, transfers between legal entities and other advanced payment features over the course of 2023-2024. In 2024, further 16 banks will join it.

The Bank plans to introduce a fee system for using digital ruble. It will be free for consumers. Businesses will have to pay a small fraction of the % (with some upper limits) from 1 January 2025 depending what the payment is for. Prior to 2025 all transactions will be free.

Russia plans to issue a fully live CBDC for consumers and businesses in 2025. Off line CBDCs are also being planned.⁴

Further information:

¹Parliamentary newspaper: Interview with Anatoly Aksakov, Chairman of the State Duma Committee on Financial Markets, 12 July 2023 (in Russian)

²The Official Internet Page of the President of Russia: The legal regime for the circulation of digital rubles has been determined by law, 24 July 2023, (documents section, in Russian and English)

³The Bank of Russia, news release: Digital ruble: start of the pilot, 9 August 2023 (in Russian)

⁴Newspaper "Vedomosti", finance section: article "When and How the digital ruble get implemented in Russia", 10 August 2023 (in Russian)

Israel: Digital Shekel

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - no. 10, Wholesale CBDC - n/a

Key developments: In September 2023, the Bank of Israel published a report on the project "Sela", a joint retail CBDC (rCBDC) experiment by the central banks of Israel (BoI), Hong Kong SAR and the BIS.

The project proved the feasibility of a rCBDC ecosystem, combining accessibility, competition and preventative cyber security, while retaining key advantages of physical cash. Sela also tested a new intermediary, the Access Enabler which reduces liquidity and settlement risks and operating costs.

The Sela ecosystem design was conducted through the lens of four key pillars: policy, legal, cyber security and technology/PoC implementation. It demonstrated to lower the barriers to entry for service providers and unbundle and redistribute the activities related to rCBDC accounts among public and private actors.

The project leveraged the bank of Israel ongoing work on its digital shekel project, its cyber security expertise and the HKMA's learnings from Project Aurum and its ongoing work on the e-HKD.

The BoI has also prepared an action plan for the potential digital shekel, but has not confirmed the issuance.

According to the BoI, the conditions supporting the decision to issue a CBDC include:

1. CBDC issuances by other countries, in particular the US, EU and other developed economies.
2. Decline in the legitimate use of cash and its acceptance in transactions in Israel, which could happen sooner than expected.
3. Significant penetration of stablecoins or other private means of payment, harming the monetary transmission.
4. The extent of competition in the domestic payment system.
5. Technological developments in the payments system justifying retail use cases enabled by a CBDC.

Next steps: The BoI is prepared to advance the issuance of the digital shekel, where circumstances support it. The steering committee will monitor the developments on a periodic basis.

Further information: The BoI's designated web page on Digital Shekel, BoI: Potential Scenarios for Deciding to Issue a Digital Shekel, April 2023, BIS: Project Sela: An accessible and secure retail CBDC ecosystem, 12 September 2023.

Singapore

Singapore: Ubin+ (wholesale CBDC)

The global CBDC project ranking, based on the BIS indicators:
Retail index: 20-30, Wholesale index: 3rd

Key developments: The Monetary Authority of Singapore (MAS) is actively involved in building the foundations for CBDCs both within the country and for cross-border transactions. It has been in multiple exploratory wCBDC projects starting with Project Ubin launched in 2016.

Ubin+ builds on the foundation of Project Ubin (2016-2020) together with the learnings from MAS' participation in Project Dunbar and the multicurrency corridor network collaboration with Banque de France (BdF). Ubin+ currently consists of 3 sub-projects, Project Cedar Phase II x Ubin+, Project Mariana and SWIFT CBDC Sandbox.

Project Cedar Phase II x Ubin+: A collaboration for cross-border transaction between the Federal Reserve Bank of New York's New York Innovation Center (NYIC) and MAS, the project aims to utilise wCBDC as the settlement asset and seeks to improve on the underlying concepts with a focus on interoperability, atomic settlement and near real-time settlement (RTS). The project concluded in May 2023, and all criteria of success were achieved.

- Interoperability across all ledgers used in Project Cedar and Ubin+;
- Atomic settlement where no central party was required to discharge the obligations of each transacting party;
- Near RTS with an average end-to-end payment latency of less than 30 seconds.

Project Mariana: A partnership involving MAS, BdF, Swiss National Bank, and the BIS, the project explores the use of Automated Market Maker (AMM) for foreign exchange settlement. The project concluded on 28 September 2023 and successfully achieved its objectives:

- Design and application of AMM for FX transactions using wCBDCs;
- Understand the roles of commercial banks as liquidity providers to facilitate FX transactions

The MAS is also taking part in the SWIFT's CBDC Sandbox made up of more than 18 central banks and commercial banks to explore the interoperability of digital currencies based payment systems. The project is still underway with SWIFT developing a beta version of the interlinking solution.

Next steps: Ubin+ is in progress with some trials completed and some underway. The MAS' envisages that the efforts into the foray of both wCBDCs would serve as the foundation to develop the financial infrastructure capable of meeting the needs of all stakeholders in this fast changing ecosystem.

Further information: MAS: Ubin+: Advancing Cross-Border Connectivity with Wholesale Digital Currencies, 15 December 2022, BIS Innovation Hub: Cross-border exchange of wholesale CBDCs using automated market-makers, 28 September 2023, SWIFT: Connecting digital islands: Results report, 5 October 2022.

Singapore: Project Orchid (retail CBDC)

The global CBDC project ranking, based on the BIS indicators:
Retail index: 20-30, Wholesale index: 3rd

Key Developments: While the MAS has primarily focused on wCBDCs and have stated that there is no immediate need for a retail CBDC system in Singapore, the MAS launched Project Orchid in late 2022 to learn and develop the technology infrastructure and technical competencies required for a retail CBDC in Singapore.

Project Orchid is a multi-year, multi-phase project which looks at the many design and technological aspects of a retail CBDC system for Singapore. It is currently in Phase I, which explores the concept of Purpose Bound Money (PBM), allowing money to be directed for a specific use and becomes unbounded once conditions are met. Phase I features four real-world trials and two upcoming campaigns:

- **Government Vouchers:** A trial government voucher system was developed to make it easier for government agencies to start and manage a voucher campaign.
- **Commercial Vouchers:** A commercial voucher trial was launched to overcome typical issues faced with the traditional commercial vouchers which tend to be paper based.
- **Government Payouts:** A proof-of-concept which allows the Singaporeans to receive government payments via facial recognition at ATMs without needing to have a bank account for individuals who do not have access to direct bank crediting.
- **Managed Learning Accounts:** A trial was initiated to resolve the issues of learning accounts such as long settlement processing time, fraudulent claims and exploitation of government payouts by utilising smart contracts to validate the enrolment, participation and redemption of government grants by end-users.
- **Programmable Rewards (upcoming)**
- **Online Commerce (upcoming)**

The MAS has also released a technical framework on PBM, building on the foundations from Project Orchid. It expounds on how digital money can be used to support both commercial and government goals. The framework was designed in an open-sourced manner with participation from various industry stakeholders.

Next Step: In the next stages, Project Orchid will engage with more stakeholders and explore more possibilities. Future areas of interest include the integration of a common QR code system, digital currency fungibility across different issuers, transaction privacy, offline payments, integration digital wallets and future experiments where individuals may be able to dictate the conditions for remittance.

Further information: MAS: Project Orchid Whitepaper, 31 October 2022, MAS: Purpose Bound Money (PBM) Technical Whitepaper, 20 June 2023.

France

France: Wholesale projects

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - n/a, Wholesale CBDC - no. 4

Key developments: Since 2020, the Bank of France (BoF) has embarked on an extensive experimentation program to understand the potential of wholesale CBDC (wCBDC) in various use cases (such as project Jura 2021, project Venus 2022 and project Mariana 2023, etc).

The experiments have three primary objectives:

- **Demonstrating viability:** showcasing how wCBDCs, utilising diverse technologies, can fulfill traditional Central Bank Money (CeBM) use cases.
- **Stimulating innovation:** assessing the advantages of integrating wCBDCs into the existing financial ecosystem and evaluating their potential to stimulate financial innovation.
- **Analysing impacts:** conducting thorough analyses of the potential effects of wCBDCs on financial stability, monetary policy, and the regulatory environment.

During twelve experiments, the BoF explored different approaches to provide CeBM for settling DLT based transactions, with a specific focus on directly issuing wCBDCs on DLT platforms.

This experimentation led to the conceptualisation of three distinct models for wCBDC provision: interoperability, distribution and integration. The models are designed to address key aspects of wCBDC implementation and offer unique capabilities and functionalities that can complement each other.

The interoperability model envisions the Eurosystem establishing its DLT infrastructure, the Eurosystem DLT, allowing TARGET participants to use euro wCBDC for settlement. The model enables connectivity with other DLTs, enhancing domestic and cross-border settlement capabilities. It employs atomic Delivery versus Payment (DvP) mechanisms for efficient settlement.

The integration model also relies on the Eurosystem's DLT but aims to settle both cash and securities legs of a transaction on the same platform. The model offers added value for scenarios requiring unified formats for both cash and securities. It can potentially replicate the functions of existing Eurosystem financial market infrastructures, extending unity to the tokenized world.

The distribution model differs from the previous two in the nature of the connection between the DLTs. Euro wCBDC and tokenized assets circulate on separate DLTs, shared between the Eurosystem and third parties, facilitating cross-border payments.

Project Jura: The objective of the Jura project was to investigate the direct transfer of significant wholesale Central Bank Digital Currencies (MNBC) denominated in euros and Swiss francs between French and Swiss financial institutions. This was achieved through a unified platform utilizing advanced distributed ledger technology, managed by a third-party operator. The experiment successfully settled tokenized assets and foreign exchange transactions using secure and efficient payment and delivery mechanisms. The experiment closely mirrored real-world scenarios, ensuring compliance with regulatory standards.

Project Venus: The Banque de France and the Central Bank of Luxembourg participated in Project Venus, where the European Investment Bank (EIB) issued bonds on a blockchain. Investors purchased cyber tokens using traditional currency, and the lead managers, including Goldman Sachs Bank Europe SE, Santander, and Société Générale, settled transactions with the issuer using central bank digital currency (CBDC).

Project Mariana: A partnership involving MAS, BdF, Swiss National Bank, and the BIS, the project explores the use of Automated Market Maker (AMM) for foreign exchange settlement. The project concluded on 28 September 2023 and successfully achieved its objectives:

- Design and application of AMM for FX transactions using wCBDCs;
- Understand the roles of commercial banks as liquidity providers to facilitate FX transactions

Next steps: The BoF's work on wCBDC is expected to intensify in the coming years. The central bank has proposed a set of principles to guide future endeavors, emphasising the enhancement of transaction efficiency and security, addressing fragmentation concerns, tackling climate-related issues, and fostering international cooperation.

Further information: BIS: Project Mariana, Cross-border exchange of wholesale CBDCs using automated market-makers, 28 September 2023, BoF's designated web page for wholesale CBDC.

United Arab Emirates

United Arab Emirates: Digital Dirham

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - no. 20-30, Wholesale CBDC - no. 5

Key developments: The Central Bank of the United Arab Emirates (CBUAE) has recently introduced its CBDC Strategy, referred to as the "Digital Dirham".

This initiative is an integral part of the Financial Infrastructure Transformation (FIT) programme, which seeks to expedite the digitalisation of the financial services industry, encourage electronic transactions and enhance the United Arab Emirates' (UAE) ability to establish itself as a leading hub for financial and digital payments, as well as an innovation center of distinction.

CBDCs are considered for both cross-border payments and domestic usage, in order to address the problems and payments inefficiencies and help to drive innovation for domestic payments.

The UAE has reached a significant stage by implementing a CBDC Strategy. A notable example was Project "Aber", which was conducted in collaboration with Saudi Arabia's Central Bank (SAMA) in 2020. The Aber project confirmed the possibility of using a digital currency issued by two central banks to settle cross borders payments reducing transfer times and costs between banks and was awarded the Global Impact Award by Central Banking Magazine.

Additionally, the country achieved a significant milestone by conducting the first real-value cross-border CBDC pilot through the "mBridge" Project in 2022. This pilot involved the participation of the Hong Kong Monetary Authority, the Bank of Thailand, the Digital Currency Institute of the People's Bank of China, and the Bank for International Settlements.

The initial stage of the CBUAE's CBDC Strategy is projected to conclude within the next 12 to 15 months and encompasses three primary components. These include the preliminary introduction of mBridge, a platform designed to facilitate cross-border CBDC transactions for international trade settlement, and the implementation of proof-of-concept initiatives for bilateral CBDC bridges with India, a key trading partner of the UAE. Additionally, proof-of-concept endeavors will be undertaken to explore the issuance of a domestic CBDC, covering wholesale and retail applications.

1. Soft launch of Project mBridge: The Central Bank of the United Arab Emirates has announced that it is proceeding with the implementation of the mBridge project in collaboration with the Bank for International Settlements, the Hong Kong Monetary Authority, the Bank of Thailand, and the Digital Currency Institute of the People's Bank of China. The UAE intends to establish the essential infrastructure for CBDCs in order to facilitate the issuance and redemption operations of its Central Bank. Additionally, the country plans to conduct a limited number of real cross-border transactions during the following 3-6 months, with the aim of being fully prepared for a complete production launch at a later stage.

2. Proof-of concept work for bilateral CBDC bridges with India: As an element of its strategic approach, the UAE is currently collaborating with India to facilitate the advancement and execution of the digital dirham.

In March 2023, the CBUAE and the Reserve Bank of India (RBI) entered into a memorandum of understanding (MoU) aimed at enhancing cooperation in the realm of financial innovation, explicitly focusing on CBDCs. The countries are developing a cross-border bilateral CBDC trial proof-of-concept. The primary objective of this initiative is to facilitate money remittances, with plans to start real-time transactions on a small scale within a few months following the completion of the proof-of-concept phase. The CBUAE plans to establish a full production bridge following the completion of proof-of-concept activities. Additionally, the CBUAE intends to assess the feasibility of adopting a similar operational framework and infrastructure to establish connections with other significant trading partners or countries with a substantial number of workers in the country.

3. Proof-of-concept endeavors to explore the issuance of a domestic CBDC, covering wholesale and retail applications: The CBUAE is expected to demonstrate these endeavors through a limited-scale production prototype involving real-money transactions within 12 to 18 months, which will be followed by a full implementation within 24 to 36 months.

Next steps: CBUAE has partnered with G42 Cloud and R3 as the designated infrastructure and technology suppliers to deploy the "Digital Dirham." G42 Cloud is a prominent supplier of cloud computing services in the UAE, whereas R3 is a globally recognized enterprise software company specialising in DLT solutions. Collectively, they will be able to provide the necessary technological competence and assistance to facilitate the creation and implementation of the Digital Dirham.

Further information: CBUAE, Central Bank Digital Currency Strategy "The Digital Dirham", 23rd of March 2023, CBUAE, Launch of the Financial Infrastructure Transformation Programme, 12 February 2023.

Canada

Canada: Digital Canadian Dollar

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - no. 20-30, Wholesale CBDC - no. 6th

Key developments:

The Bank of Canada has actively cooperated on cross-border wholesale CBDC projects since 2017.

In November 2022, the Federal Government announced a legislative review, focused on the digital money as well as the financial sector stability and security.

The Bank of Canada's stated objectives of researching a digital Canadian dollar are financial inclusion and protection of the economy and financial systems.

In H1 2023, the Bank of Canada ran a public consultation to understand which features are most important to Canadians. The consultation attracted over 85,000 responses.

In particular, the central bank sought views on how people would likely use it, what security features are important and what concerns users may have about accessibility and privacy.

Next steps:

The Bank of Canada intends to publish a report summarising the results of the public consultation at the end of 2023.

At present, the formal position remains that there is no need to issue a CBDC.

Further information: The Bank of Canada's designated web page for the Digital Canadian Dollar.



The European Union

The European Union: Digital Euro (Retail CBDC)

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - no. 20-30

Key developments: The Governing Council of the European Central Bank (ECB) decided on 18th October to move to the next phase of the digital euro project: the preparation phase. To support the initiative, the European Commission previously announced the Single Currency Package in June 2023, proposing a European Regulation for establishing the digital euro.

The legislative proposal sets the framework for the implementation of the digital euro with the following key features:

- digital euro will be legal tender to support a wide diffusion of the digital euro;
- there should be limitations of digital euro as a store of value to guarantee the financial stability;
- European Commission stated that there will be a central role of supervised intermediaries in service distribution; and
- specific measures should be taken to guarantee privacy and data protection and to manage AML/CFT rules.

The proposal sets the guidelines related to the accessibility that the new form of money should have. Specifically, the digital euro should support the financial inclusivity, facilitating forms of payment among individuals, businesses, and public administration.

Other key features are related to the main functionalities that the digital euro would have. Those include:

- real time settlement for payment transactions;
- possibility to provide Value Added Services as automated transactions for deposits; and withdrawals, scheduled automatic payments and enabling machine-to-machine payments.

Regarding features, it is important to underline that the digital euro should not be a form of programmable money.

To provide free basic digital euro services to individuals and ensure its acceptance as legal tender, a remuneration model is needed for payment service providers (PSPs). This model should include merchant and inter-payment service provider fees, compensating for distribution costs and allowing for a reasonable profit margin. The ECB will regulate these fees to align with costs and comparable payment methods, while not charging PSPs for Eurosystem costs.

Next steps: Starting on 1st November 2023¹, the preparation stage of the digital euro initiative is set to extend for an initial period of two years. This phase will encompass key tasks such as finalizing the digital euro rulebook and identifying potential providers capable of developing the required digital euro platform and infrastructure.

Further information: European Commission "Proposal for a REGULATION on the establishment of the Digital Euro"; ECB "Annex 1: Functional and non-functional requirements linked to the market research for a potential digital euro implementation", ¹ECB 2023: Eurosystem proceeds to next phase of digital euro project.



The European Union: NTW-CG (Wholesale CBDC)

The global CBDC project ranking, based on the BIS indicators:
Wholesale CBDC - no. 7

Key developments: In June 2023, the European Central Bank (ECB) embarked on a wholesale CBDC development with the inaugural meeting of the New Technologies for Wholesale Settlement Contact Group (NTW-CG).

The primary objective of NTW-CG, as defined by the ECB, is to establish a robust dialogue between the Eurosystem and financial market stakeholders on innovative technologies for wholesale settlement. The dialogue aims to harness feedback from members, enhance the ongoing initiatives of Eurosystem central banks, and explore the different solutions and synergies between TARGET Services and DLT platforms.

The ECB has introduced three pivotal interoperability-type solutions: Trigger, TIPS Hash-Link, and Full-DLT Interoperability.

Next steps: The ECB prepares to intensify its efforts in 2024 with further discussion on the specifications of interoperability-type solutions. Addressing queries regarding trial and experiment scopes, legal aspects, and solution specifics will be a priority.

In 2024, the NTW-CG meetings will enter in a concrete exploratory work. These endeavors will shape the future landscape of wholesale CBDC development and pave the way for practical implementation and industry adoption.

Further information: European Central Bank: Minute of the First meeting of the Eurosystem's market contact group on new technologies for wholesale central bank money settlement, 21 June 2023.

South Africa

South Africa: Project Khoka

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - no. 30-40, Wholesale CBDC - no. 8

Key developments: South Africa completed its second phase of wholesale CBDC trials for Project Khoka in 2022. Since then the South African Reserve Bank (SARB) has continued its technical exploration of the blockchain technology in regulated markets to unpack the policy and regulatory implications of potential new forms of money and tokenization.

The SARB has indicated that there is no exact timeline set for the CBDC at this stage, as it is still on a learning journey.

The focus is on a wholesale CBDC rather than a retail CBDC. The project Kohka proved to the SARB that a CBDC could be done on the wholesale level. The SARB is less forthcoming about a the need for a retail CBDC and it is likely that cash and bank cards will remain the dominant payment methods for some time.

South Africa has launched a new payment mechanism called PayShap, which is intended to perform similar functions to a retail CBDC, the low-value, real-time rapid payment platform, is aimed at deepening digital financial inclusion of both consumers and small businesses by making digital payments more convenient and reducing the reliance on cash in the economy. It offers consumers access to instant, real-time payments across participating banks with low fees attached.

Next steps: The Governor of the SARB has said, "With respect to retail CBDCs, we cautiously took a decision that we are going to be very good students. We are going to learn with everybody. We are not going to be the first movers. We would rather be very fast followers because of the complexities".¹

Further information: SARB: Annual Report 2022/23,

¹World Economic Forum: Panel at the annual World Economic Forum (WEF) meeting, 19 January 2023. SARB Media Relation: PayShap, 13 March 2023.



Brazil and Indonesia

Brazil: Drex

The global CBDC project ranking, based on the BIS indicators: Retail CBDC - no. 40-50, Wholesale CBDC - no. 20-30

Key developments: Since August 2020, the Brazilian Central Bank, has been developing a CBDC, Drex, which will allow many types of financial transactions with digital assets and smart contracts.

These smart financial services will be settled by banks within the Brazilian Central Bank's Drex Platform, which is a developing environment using DLT.

On the Drex Platform, regulated financial intermediaries will convert balances of demand deposits and electronic money in Drex, giving their clients and consumers access to smart financial services.

According to the Central Bank, the smart financial services – automated, programmable, standardised and safely conducted within the Drex Platform – will favour the entrance of new financial services providers and the emergence of innovative business models. Therefore, the implementation of Drex is expected reduce the costs of traditional and innovative financial transactions, supporting, ultimately, the financial democratisation.

The DLT infrastructure for Drex allows a high degree of auditability, traceability and transparency, ensuring the necessary tools for its supervision and regulation.

Next steps: There is still no specific date for the launch of Drex. It is in the testing phase in a restricted environment, the Drex Pilot, which began in March 2023.

By the end of 2024, the Brazilian Central Bank aims to include testing with the retail population in the Drex Pilot. In order to achieve this goal, the project and market participants will need to have reached the appropriate degree of maturity.

The Drex, will be issued by the Brazilian Central Bank itself, for wholesale transactions (settlement of transactions between authorized institutions) or by institutions authorised by the Brazilian Central Bank for retail transactions.

Further information: See the Brazilian Central Bank's dedicated web page for Drex – Digital Brazilian Real.



Indonesia: Digital Rupiah

The global CBDC project ranking, based on the BIS indicators: Retail CBDC - no. 40-50, Wholesale CBDC - no. 20-30

Key developments: In November 2022, Bank Indonesia (BI) initiated Project Garuda for the development of Indonesia's CBDC, digital rupiah. The project is driven by the growth in digital economy, with the rise of fintech and e-commerce within the region pushing forward digital asset innovation in the financial sector.

The CBDC is in the design and development stage. BI issued the white paper for retail and wholesale digital rupiah in November 2022 and a wholesale CBDC consultative paper in January 2023. The proof of concept and private blockchain technology (DLT) solution selection is in progress.

The project is a nation-wide initiative, requiring synergy from all stakeholders. It has three major objectives in policy: digital rupiah sovereignty, international initiative, as well as national financial system development and digital finance integration. The project also includes seven governance areas: monetary and payment system, financial system stability, government transaction, national security, consumer protection, international relations, and exchange of crypto assets.

The project leverages DLT. The end-to-end development considers three factors: integration, interoperability, and interconnection. The aim is to design a CBDC with robust features, while leaving room for new business model development supporting innovation, inclusiveness and efficiency.

The project includes three layers, namely: 1) technology platform (smart contract, identity service, regulatory service, cryptography, API), 2) digital assets (digital tokens & security) and 3) use cases (transactions and exchange).

Digital rupiah would be issued by BI to financial institutions (w-CBDC) and circulated to retailer consumers and merchants (r-CBDC). BI would provide banks and financial institutions the required infrastructure. The verification mechanism for w-CBDC would be token-based, while r-CBDC would be account-based.

Next steps: The DLT solution selection will be followed by the configuration implementation of the DLT within BI and market participants, as per the Project Garuda roadmap.

The roadmap includes three main stages:

- | | | |
|--|--|---|
| <ul style="list-style-type: none"> • w-Digital Rupiah Cash Ledger – Issuance & Redemption – Interbank Fund Transfer | <ul style="list-style-type: none"> • w-Digital Rupiah Cash & Securities Ledger – Interbank Money Market – Monetary Operations – CCP Connection | <ul style="list-style-type: none"> • Integrated end-to-end w-Digital Rupiah to r-Digital Rupiah – Distribution, Collection, P2P – r-CBDC wholesaler to retailer – r-CBDC direct from central bank |
|--|--|---|

Further information: BI: Project Garuda: Navigating The Architecture Of Digital Rupiah, November 2022, Project Garuda, wholesale digital rupiah cash ledger, 31 January 2023.

Saudi Arabia

Saudi Arabia: CBDC Updates

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - n/a, Wholesale CBDC - no. 12

Key developments: In January 2023, the Central Bank of Saudi Arabia (SAMA) announced its engagement in a project phase which explores potential use cases of a domestic wholesale CBDC, in a partnership with local banks and financial technology companies.

SAMA's project aimed to investigate the economic consequences of CBDCs, assess the market's readiness and evaluate the possible efficacy of a payment solution based on CBDC. Furthermore, SAMA evaluated policy, legal and regulatory factors before advancing to future stages of the CBDC journey, while considering the goals outlined in the country's Vision 2030.

SAMA has already executed a CBDC experiment known as "Project Aber" in 2019, with the Central Bank of the United Arab Emirates (CBUAE). The project aimed to assess the feasibility of a unified dual-issued digital currency as a means of facilitating domestic and cross-border transactions between the two nations.

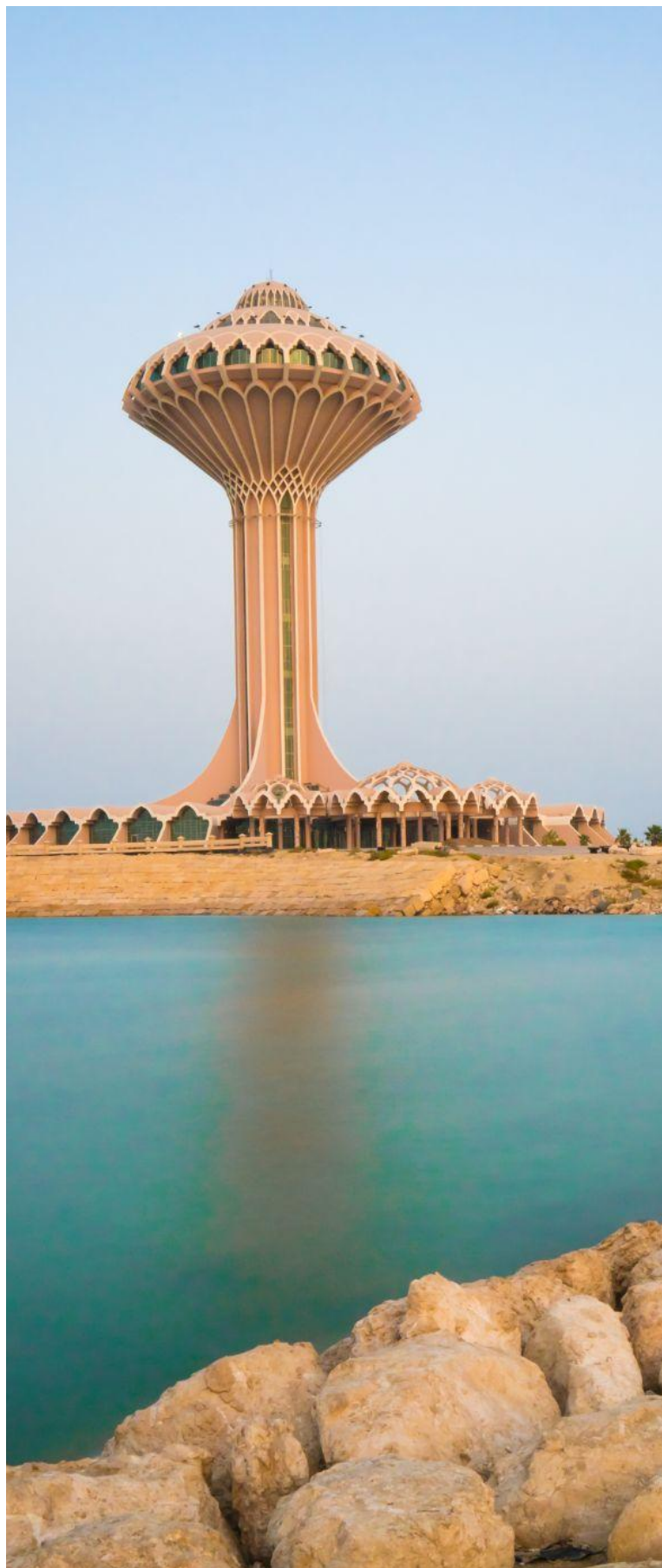
The project encompassed the participation of commercial banks from both countries, along with the Central Banks. Monetary transactions were conducted and three primary applications were evaluated.

One potential use case involved the utilisation of the experiment CBDC "Aber" as a settlement asset for domestic payments between commercial banks in one jurisdiction. The second use case utilised "Aber" as a settlement asset for cross-border payments between commercial banks in different jurisdictions. The third use case covered the utilisation of "Aber" as a settlement asset for facilitating cross-border payments between several Central Banks.

Project Aber's foundation was built on Hyperledger Fabric, a DLT platform which operates within a private framework and provides support for the execution of smart contracts. Each Central Bank maintained its own Fabric network, consisting of its nodes and channels. The involved commercial banks were linked to both networks via a shared channel. The central banks issued the "Aber" tokens on their various networks and subsequently transferred them between networks using atomic swaps. Nevertheless, "Project Aber" encountered several challenges, such as scalability, privacy measures, governance structure, regulatory compliance, and legal considerations.

Next steps: SAMA continues to explore a wholesale CBDC. No definitive decision to initiate the implementation has been made.

Further information: SAMA, Saudi Central Bank continues CBDC experimentations, 23 January 2023, SAMA and CBUAE: Joint Digital Currency and Distributed Ledger Project "Aber", 2020.



Switzerland

Switzerland: Project Helvetia

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - no. 20-30, Wholesale CBDC - no. 11

Key developments: Project Helvetia was initiated as a pilot test, at the initiative of various organisations, including the Swiss National Bank (SNB), the Bank of International Settlement Innovation Hub (BIS) and SIX (the main Swiss stock exchange). This project consists of phases aiming to integrate a central bank digital currency (CBDC) into the Swiss financial market infrastructure and for the custody and transfer of tokenized securities based on DLT.

Project Helvetia is the continuation of a series of experiments that were initiated by the SNB and preceded by Project Jura, performed from 2020 till 2021, where direct transfers of Euros and Swiss Franc wCBDCs were tested between French and Swiss commercial banks on a single DLT trading platform operated by a third party.

Project Helvetia is a multi-phase investigation into how central banks could offer settlement with monies issued by the central bank, provided that in the future, it is expected that a significant proportion of settlements will be made using this new mechanism.

Phase I, was finalised in December 2020. Two approaches were explored and tested: first, the issue of central bank tokens for financial institutions (wholesale CBDC – wCBDC), and second, the creation of an interface between DLT-based financial market infrastructure and the Swiss Interbank Clearing payment system. The results of Phase I showed that both approaches are technically feasible and can be implemented under the current Swiss legal and regulatory regime.

Phase II further explored the concept of settlement in wCBDC by:

- i. adding five commercial banks to the experiment
- ii. integrating wCBDC into the core banking systems of the SNB and commercial banks; and
- iii. running transactions from end to end.

In this second stage of the pilot project, settlement instructions for financial transactions were entered by commercial banks or by the SNB and the instructions were matched and finally settled in wCBDC on the digital exchange platform of SIX, before being booked and reconciled in the respective core banking systems.

As per its stakeholders, Phase II demonstrated that:

- i. wCBDC can be integrated into existing core banking systems and processes used by commercial and central banks;
- ii. Issuing a wCBDC on a DLT platform operated and owned by a private sector company is feasible under the Swiss legal framework;
- iii. Transition towards a tokenized financial ecosystem raises broader issues such as increased market and settlement complexity, liquidity management challenges, or integration of trading settlement.

Next steps: Recently, the president of the SNB declared that a new non-experimental wCBDC pilot project is under discussion. The SNB plans to create real money equivalent to bank reserves aiming to test transactions with market participants. However, the SNB has not communicated official information on the launch.

At an international level, the SNB has also participated in project Mariana, expanding on previous wCBDC experiments by the BIS Innovation Hub and exploring concepts developed in decentralised finance (DeFi) applications. Conducted together with the Bank de France and the Monetary Authority of Singapore, project Mariana aims at testing whether automated market-makers (AMMs) using wCBDCs could improve the effectiveness, safety and transparency of FX trading and settlement. It also examined cross-border interoperability using wCBDC based on a uniform technical standard, as a way to future-proof CBDC developments. The SNB has recently issued its final report on the project. The report concludes that the use of advanced technologies (tokenization and AMMs) hold promise for enhancing cross-border transactions of wCBDCs, by enabling efficient and secure transactions. However the report identifies the need for further exploration and collaboration, which are crucial to fully explore the potential benefits of tokenization and DeFi applications in shaping the future of financial transactions.

Further information:

BIS: Project Mariana, Cross-border exchange of wholesale CBDCs using automated market-makers, 28 September 2023, Swiss National Bank: Project Mariana web page.



United Kingdom

United Kingdom: Digital Pound

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - no. 19, Wholesale CBDC - no. 17

Key developments: The Bank of England (BoE) and HM Treasury have indicated that a retail CBDC will 'likely' be needed, but formal decisions have not been made.

The key driver is the shift in the UK payments landscape, marked by the decline in the use of central bank cash and the growth of digital assets. The Government also recognises innovation, competition and financial inclusion among the potential benefits.

The UK consulted on the retail CBDC in H1 2023. The proposals highlights the benefits and design features of a digital pound.

Should the UK proceed, the BoE will issue the digital pound and provide the central infrastructure, including the core ledger. Private institutions will be able to integrate into the CBDC infrastructure and serve as the interface between the BoE and users.

Additional key features listed in the consultation included:

- accessible via 'pass-through' wallets provided by the private sectors, with funds held on the BoE ledger;
- accessible to UK and non-UK residents;
- no interest paid;
- privacy protected at the same level as cards and bank accounts;
- not anonymous;
- exchangeable with other forms of money, including cash and deposits;
- an initially proposed limit per user: between £10,000 and £20,000; and
- corporates will also be limited, but no limit proposed.

Banks, Payment Interface Providers (PIP) offering wallets to end users, and External Service Interface Providers (ESIP) offering non-payment services, could access the BoE's ledger and provide services, but would require authorisation.

The authorities do not propose to develop a digital pound which enables government or central bank-initiated programmable money. PIPs and ESIPs could be permitted to implement such functionalities, but they would require user consent and would not be at authorities' direction.

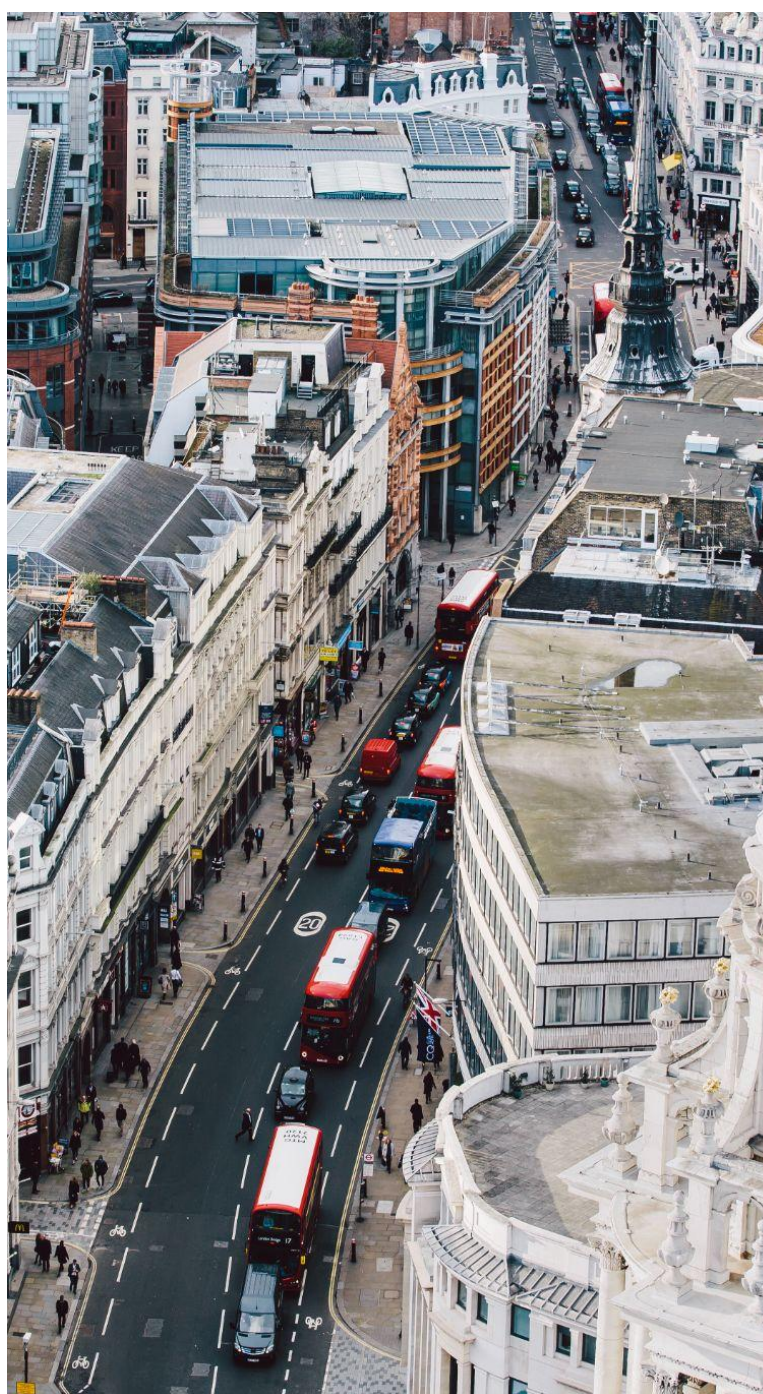
The authorities have also highlighted the risk that the digital pound could affect financial and monetary stability due to bank disintermediation, which refers to the loss of some deposits by commercial banks. This could lead to an increase in the cost of lending and disruptions in the transmission of monetary policy.

While the authorities note the potential advantages of incorporating DLT in wholesale markets, the BoE currently favours improving existing systems and fostering private sector innovation over developing a CBDC for wholesale use.

Next steps: In 2023, the digital pound project moved from exploration to design phase, with a focus on technology and policy options. The work is done in a partnership with market participants and academia.

The authorities are expected to issue the consultation response by 2024.

Further information: The BoE's designated web page for the Digital Pound.



United States

United States: Digital Dollar

The global CBDC project ranking, based on the BIS indicators:
Retail CBDC - no. 18, Wholesale CBDC - no. 16

Key developments: The United States Federal Reserve (Fed) has been exploring the potential of CBDCs to address both wholesale and retail financial needs. The significant global role of the US dollar as a reserve currency requires that the Fed remains at the forefront of CBDC research, policy development, and technology Innovation.

To that end, CBDC efforts to date have focused on fostering a deep understanding of the implications, design, risks, and opportunities surrounding CBDCs. Research and prototyping efforts by the New York Innovation Center (NYIC), the Boston Fed's partnership, Massachusetts Institute of Technology (MIT) and others are demonstrative of the proactive approach the USA is taking in this domain.

With the current state of American politics it has been difficult for a CBDC to move past a research phase, but it is clear that a focus on privacy is of utmost importance given recent developments in the House Financial Services Committee. As recent as October, the Vice Chair of Supervision at the Fed Michael Barr explained that research is currently focused on "end-to-end system architecture" and how the underlying ledger will be maintained.

Key research developments

Project Cedar & NYIC: Project Cedar focused on using DLT to test the concept of regulated liability network (RLN). RLN is a theoretical payment infrastructure designed to support CBDC exchange and settlement in both domestic interbank payments and cross-border USD payments.

- Results: The Phase 1 report indicated that CBDCs can enable faster and safer cross-border payments. Future phases will explore considerations for ledger platform design, interoperability and security.

Project Hamilton (MIT & Boston Fed collaboration): Project Hamilton aimed to design a core transaction processor for a hypothetical wholesale CBDC. The prototype was developed to be "technology-agnostic", i.e. not assuming a blockchain infrastructure.

- Results: The project results have provided a strong foundation for understanding the interplay between policy and technology choices when designing a CBDC. This work has also shed light on the technological capabilities and limitations of different CBDC design options.

The Digital Dollar Project: The Digital Dollar Project is a non-profit forum focused on exploring the use cases and utility for a US CBDC. This year the project released the results of its pilot study which evaluated the potential benefits of using CBDCs for retail cross-border remittances.

- Results: The study found that enabling 24/7 settlement with a digital dollar had potential to significantly reduce credit risk, reconciliation, and related dispute management costs. Additionally, using DLT increased transparency between financial institutions, resulting in greater trust.

International collaborations & benchmarking:

The Federal Reserve's engagement with other central banks and international entities, like the collaborations in Project Cedar with NYIC, represent the USA's commitment to a globally harmonised approach to CBDCs, gleaning from international expertise and insights.

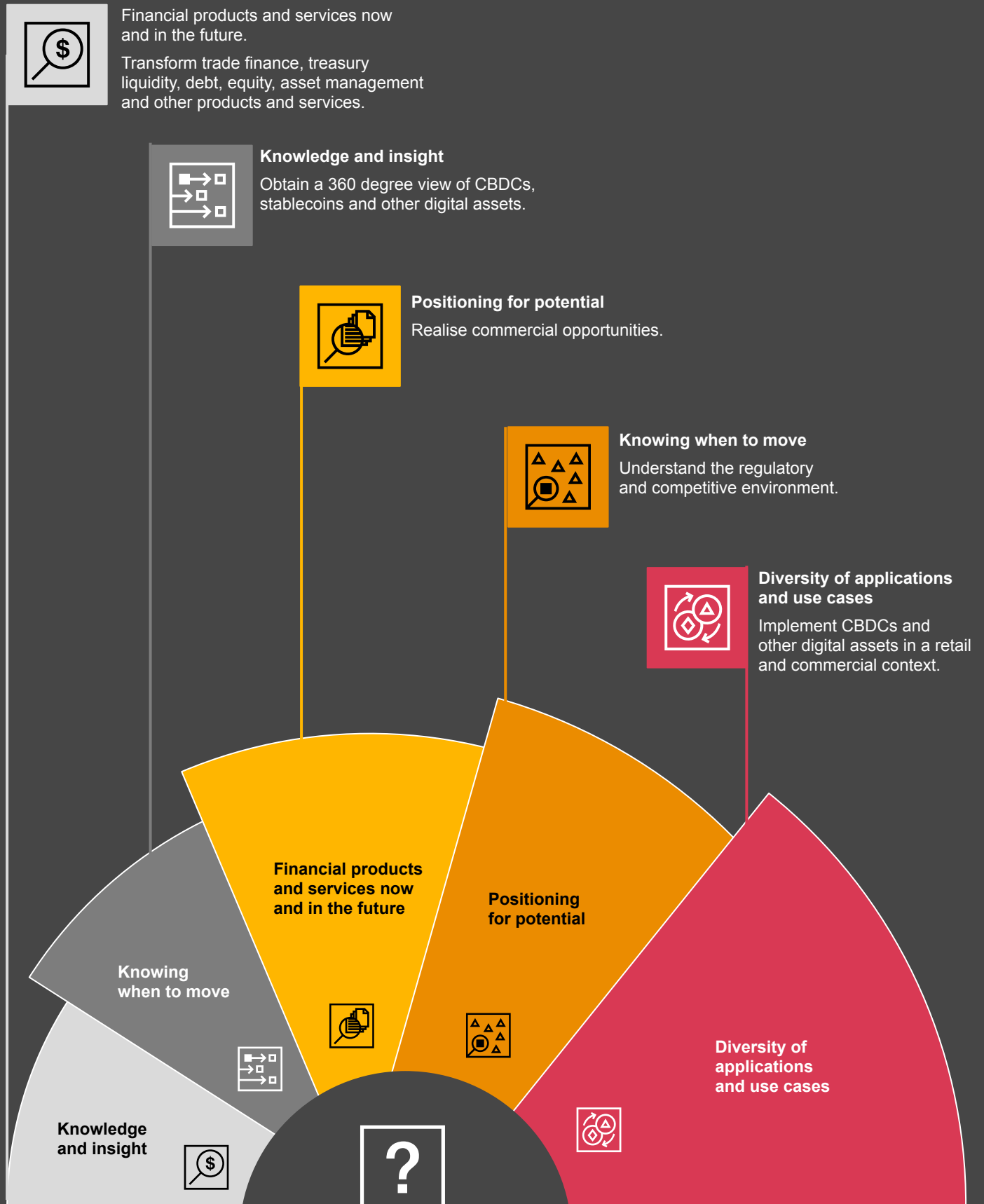
Next steps: While other developing countries have accelerated activities over the past year the US continues to take a steady approach based the importance of integrating both technological and policy solutions. The Federal Reserve advocates for a responsible innovation approach that respects private sector innovations and ensures the stability of the U.S. banking system. Clear regulatory frameworks are being prioritised to safeguard consumers and maintain the integrity of financial transactions, both domestically and cross-border.

Further information: The United States Federal Reserve System's dedicated web page on Central Bank Digital Currency (CBDC), Federal Reserve Bank of Boston's report on the collaboration with MIT (22 December 2022), and Federal Reserve Bank of New York's findings on Project Cedar Phase II x Ubin+ (4 November 2022).



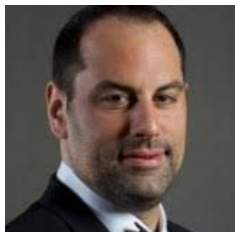
How can PwC help?

PwC has worked on numerous CBDC and stablecoin projects globally, supporting central banks and private companies to assess and launch CBDCs and stablecoins. We support our clients from design to deployment and use.



Core contributors

United States



Matthew Blumenfeld, Web3 & Digital Assets Lead, PwC US
matthew.blumenfeld@pwc.com



Jack Kiernan, Director, PwC US
jack.kiernan@pwc.com



Bryena Jyoti, Director, PwC US
bryena.jyoti@pwc.com

United Kingdom



Laura Talvitie, Senior Manager, PwC UK
laura.talvitie@pwc.com



Chandrakumar Thangavel, Manager, PwC UK
chandrakumar.k.thangavel@pwc.com

Italy



Stefano Rossi, Senior Manager, PwC Italy
stefano.rossi@pwc.com



Lorenzo Amoroso, Senior Associate, PwC Italy
lorenzo.amoroso@pwc.com

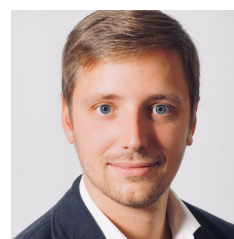


Gioele Marcellan, Associate, PwC Italy
gioele.marcellan@pwc.com

France



Flora Camp, Partner, PwC France
flora.camp@pwc.com



Aymeric Monnier, Manager, PwC France
aymeric.m.monnier@pwc.com



Sébastien Pierre, Senior Associate, PwC France
sebastien.pierre@pwc.com

Regional subject matter experts

PwC Australia

Sagan Rajbhandary

Director

sagan.a.rajbhandary@hk.pwc.com

PwC Bahamas

Myra Lundy-Mortimer

Partner

myra.lundy-mortimer@pwc.com

PwC Brazil

Rosana Napoli

Partner

rosana.napoli@pwc.com

Sidnei Massumi

Senior Manager

sidnei.massumi@pwc.com

PwC Canada

Ryan Leopold

Partner

ryan.e.leopold@pwc.com

PwC Eastern Caribbean

Anthony Zamore

Director

anthony.l.zamore@pwc.com

PwC India

Mihir Gandhi

Partner

mihir.gandhi@pwc.com

Zubin Tafti

Managing Director

zubin.tafti@pwc.com

Kanishk Sarkar

Senior manager

kanishk.sarkar@pwc.com

Karan Mahajan

Manager

karan.mahajan@pwc.com

PwC Israel

Eran Raz

Partner

eran.raz@pwc.com

Idan Caduri

Senior Manager

idan.caduri@pwc.com

Ronen Kilevich

Manager

ronen.kilevich@pwc.com

PwC Indonesia

Widita Sardjono

Partner

widita.sardjono@pwc.com

PwC Italy

Matteo Pigatto

Senior Manager

matteo.pigatto@pwc.com

Niccolò Polcri

Senior Manager

niccolo.polcri@pwc.com

PwC Jamaica

Carolyn Bell

Partner

carolyn.bell@pwc.com

Natalie Fearon

Manager

natalie.fearon@pwc.com

PwC Japan

Tomoyuki Ashizawa

Partner

tomoyuki.ashizawa@pwc.com

Tomohiro Maruyama

Director

tomohiro.m.maruyama@pwc.com

Marc Park

Senior Manager

marc.park@pwc.com

PwC Mainland China and Hong Kong SAR

Duncan Fitzgerald

Partner

duncan.fitzgerald@hk.pwc.com

Michael Footman

Partner

michael.hc.footman@hk.pwc.com

Gary Ng

Partner

gary.kh.ng@hk.pwc.com

Henry Cheng

Senior Advisor

henry.f.cheng@hk.pwc.com

Sagan Rajbhandary

Director

sagan.a.rajbhandary@hk.pwc.com

Oscar Fung

Senior Manager

oscar.sk.fung@hk.pwc.com

Regional subject matter experts (continued)

PwC Middle East

Serena Sebastiani

Director

sebastiani.serena@pwc.com

Karim Mouaffak

Associate

karim.mouaffak@pwc.com

PwC Singapore

Wanyi Wong

Partner

wanyi.wong@pwc.com

Wei Jie Chan

Director

wei.jie.chan@pwc.com

PwC South Africa

Kerin Wood

Partner

kerin.wood@pwc.com

Costa Natsas

Partner

costa.natsas@pwc.com

Cindy Anderson

Senior Manager

cindy.anderson@pwc.com

Michael Stieger

Manager

michael.stieger@pwc.com

PwC South Korea

Robert Browell

Partner

robert.browell@pwc.com

PwC Sweden

Claes Mårtensson

Director

claes.maartensson@pwc.com

Babel Ferrow

Senior Manager

babel.ferrow@pwc.com

PwC Switzerland

Jean-Claude Spillmann

Partner

jean-claude.spillmann@pwc.ch

Adrian Keller

Partner

adrian.keller@pwc.ch

Adrien Tharin

Director

adrien.tharin@pwc.ch

Silvan Thoma

Director

silvan.thoma@pwc.ch

Cecilia Peregrina

Senior Manager

cecilia.peregrina@pwc.ch

Ivana Ristevska

Senior Associate

ivana.ristevska@pwc.ch

PwC Thailand

Vilaiporn Taweelappontong

Partner

vilaiporn.taweelappontong@pwc.com

Jirath Hirunpaphaphisoot

Director

jirath.hirunpaphaphisoot@pwc.com

PwC Ukraine

Liusia Pakhuchaya

Partner

liusia.pakhuchaya@pwc.com

Hanna Oliinyk

Director

hanna.oliinyk@pwc.com

Viktoriiia Shcherbyna

Senior Associate

viktoriiia.shcherbyna@pwc.com

PwC United Kingdom

Yulia Baynham

Director

yulia.baynham@pwc.com

Laura Talvitie

Senior Manager

laura.talvitie@pwc.com

Hugo Rosseau

Manager

hugo.rousseau@pwc.com

PwC United States

Caroline McIlroy

Senior Manager

caroline.mcilroy@pwc.com

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