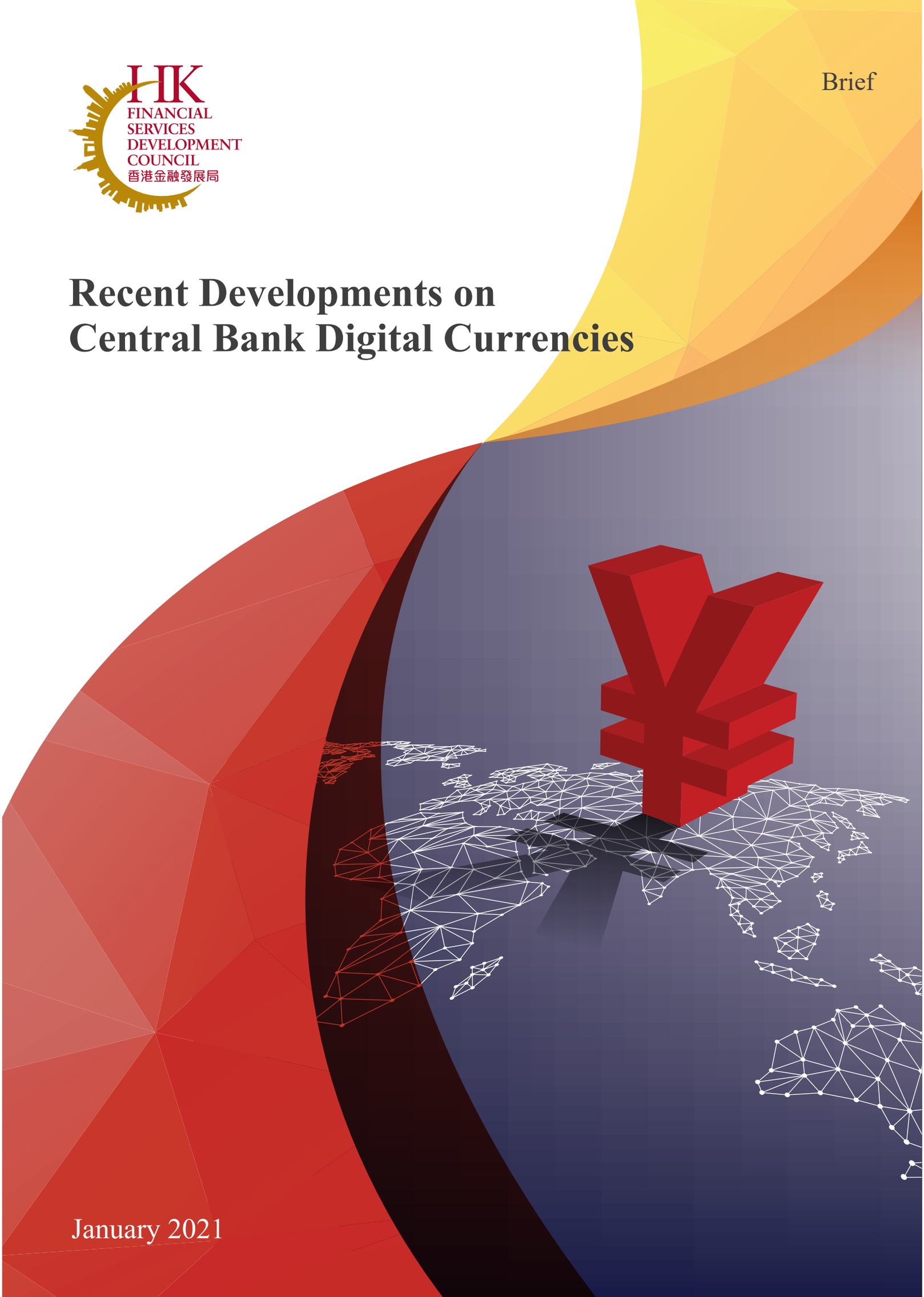
FINANCIAL SERVICES DEVELOPMENT COUNCIL
香港金融發展局

Brief

Recent Developments on Central Bank Digital Currencies



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Overview – What does CBDC mean to Mainland China and other markets

Central Bank Digital Currencies ("CBDCs"), as a novel concept in the tide of FinTech development, have gradually gained traction in different markets. Despite the absence of an agreed definition, the term 'CBDC' tends to be interpreted in a generally similar manner. For instance, the International Monetary Fund ("IMF") staff defines it as "a new form of money, issued digitally by the central bank and intended to serve as legal tender";[1] some consider CBDCs as a subcategory of sovereign digital currency that is used by a central bank. Generally speaking, central bank money now comprises physical cash and reserves held at the central bank by financial institutions with access to the central bank's deposit facility, and CBDCs would become a third form of central bank money.[2]

CBDCs that are being researched, or even going through the pilot testing, take various forms – differing mainly across four parameters:

(i) Users – whether the CBDC is intended for some or all sorts of intermediaries, for wholesale and/or retail transactions, etc.

(ii) Scope – whether the CBDC is for monetary or payment arrangement or both;

(iii) Architecture – adopting any of the three models in the context of account-or token-based structures:

- centralised: users have their respective accounts with the central bank where their units of value are stored and available for transactions;
- decentralised: without an identifiable scheme operator, while financial institutions and other institutions act as intermediaries to provide 'wallet' services to enable users of the digital currency to transfer value; or
- hybrid: a combination of centralised and decentralised approaches, which enables the use of central bank accounts while not all users are required to have such an account in order to use the CBDC (for example, intermediaries link the users to the central bank and each of these intermediaries runs its own decentralised system).

(iv) Technology – an evolving range of options, such as conventional means like real-time gross settlement ("RTGS") systems and more emerging types like distributed ledger technology ("DLT") are being explored.

[1] International Monetary Fund, Staff Discussion Notes – Casting Light on Central Bank Digital Currency, November 2018.
[2] World Economic Forum, Central Bank Digital Currency Policy-Maker Toolkit, January 2020.

CBDC in Mainland China: e-CNY

Mainland China has embarked on the journey of CBDC research as early as in 2014.[3] After some years of work, the country announced in 2019 that it would launch its Digital Currency/ Electronic Payment (DC/EP) project to create digital Renminbi, a digital form of fiat money.[4] With Xiangcheng District of Suzhou pioneering the use of e-CNY as employee traffic subsidies in April 2020, China officially commenced the exploration of putting e-CNY into real-life testing.[5] In the same month, the People's Bank of China Digital Currency Research Institute announced that the research and development of digital RMB was progressing steadily. In August 2020, internal pilot tests, according to official announcement, would be carried out in qualified cities in the Guangdong-Hong Kong-Macao Greater Bay Area, the Beijing-Tianjin-Hebei region, the Yangtze River Delta region, and some places in central and western China.[6] Accordingly, the People's Bank of China ("PBoC") started coordinating with relevant authorities in Shenzhen, Chengdu, Suzhou, Xiong'an and the future Winter Olympic venue in Beijing; it also said that it would consider whether to expand the scope to other cities/regions.[7] In early September 2020, Xiong'an – one of the pilot cities for e-CNY – officially announced its plan to explore the use of digital currencies for cross-border transactions, as a follow up to the official authorisation of the State Council on establishing Cross-Border e-Commerce Comprehensive Pilot Areas.[8] The RMB in "both physical and digital types" is covered in the draft of the revised central bank law "Law of the People's Republic of China on the People's Bank of China", in relation to which the PBoC launched a one-month consultation in October to gather public opinion.[9]

Based on information available on the public domain, e-CNY is said to have the following features: –

a) e-CNY is legal tender fully backed by the credit of the PBoC, and is converted 1:1 to RMB. e-CNY is regarded as the digitalised version of physical cash (i.e., paper cash, coins and banknotes); in other words, it is the (partial or entire) substitute of money in circulation ("M0").[10] There would be no speculation on its value, and it would not need the backing of a basket of currencies.[11]

b) e-CNY operates on two tiers. At the upper tier, the PBoC issues e-CNY to commercial banks and other commercial operating agencies; and at the lower tier, these banks and agencies are asked to distribute e-CNY to the public. Commercial banks pay 100% reserves to the PBoC; and then the public open digital wallets at these commercial institutions.[12] Blockchain will unlikely be adopted at the upper tier given the high frequency use needed but the precise technology used can be more flexible at the lower tier.[13,14]

[3] 人民网, 传闻中的法定数字货币真的来了！, May 2020. (in Chinese only)
[4] Ibid.
[5] Wall Street Journal, China Rolls Out Pilot Test of Digital Currency, April 2020.
[6] 中国政府网, 全面深化服务贸易创新发展试点总体方案 (附表：全面深化服务贸易创新发展试点任务、具体举措及责任分工), August 2020. (in Chinese only)
[7] ibid
[8] 河北省人民政府办公厅，河北省人民政府办公厅关于印发中国（雄安新区）跨境电子商务综合试验区建设实施方案的通知，September 2020. (in Chinese only)
[9] China Daily, Revised bank law set to give green light to digital RMB, October 2020.
[10] UBS, Information technology - Understanding China's digital currency and blockchain initiatives, April 2020.
[11] 上海证券报, 穆长春: 人民银行数字货币不具有炒作特性, December 2019. (in Chinese only)
[12] 零壹财经, 人民币3.0中国央行数字货币: 运行框架与技术解析, October 2019. (in Chinese only)
[13] 第一财经, 穆长春谈央行数字货币：研究了五年，现"呼之欲出", August 2019. (in Chinese only)
[14] Depending on the technology applied, the nature of the asset created at the lower tier may not be the same e-CNY. In that case, participants in the lower tier may be creating an asset which is linked to e-CNY but is different in nature.

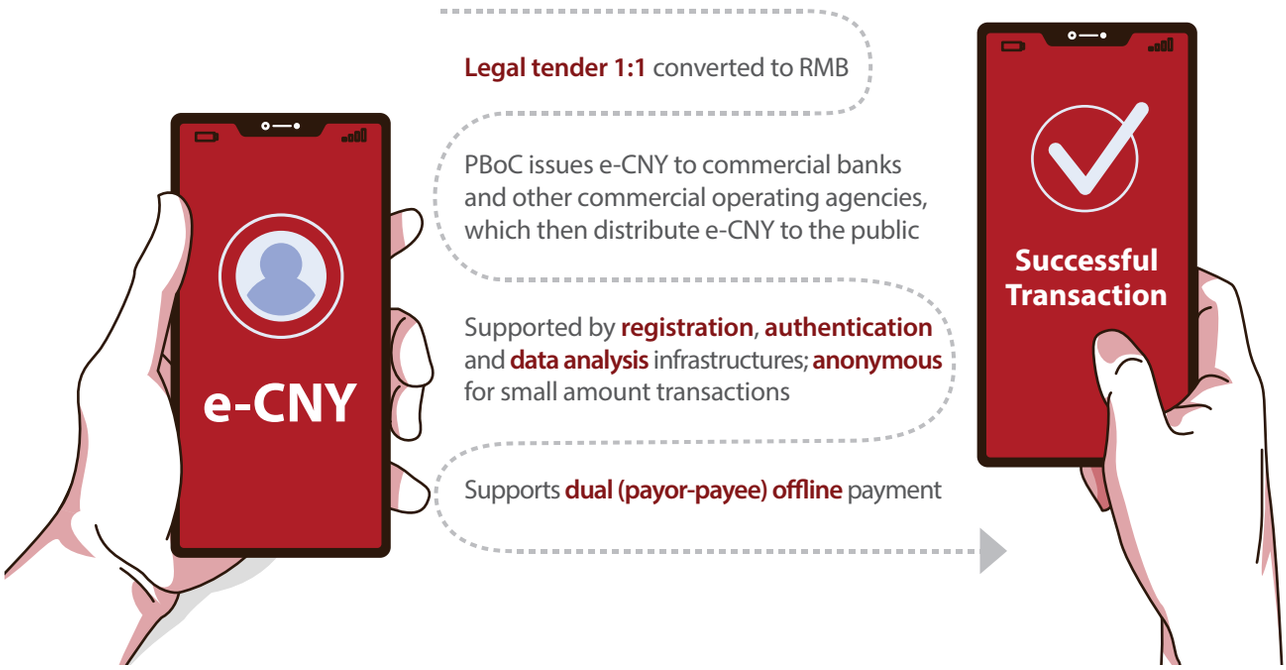
c) e-CNY will be supported by infrastructures covering 1) registration (i.e. production, circulation, auditing and the cancellation of digital money),[15] 2) authentication processes in which e-CNY transaction data is centralised, controlled by and only visible to the PBoC; all other parties in a transaction are not able to trace the underlying e-CNY users or their transaction history without the permission of the users,[16] and 3) analysis of transaction data (particularly large-amount transactions) would be useful in performing different sorts of analysis, for example on payment behaviour analysis and for anti-money laundering purposes.[17]

Within the design of the e-CNY, there are also two distinctive attributes – "dual offline payment" and "loosely coupled account links". With these attributes, e-CNY is capable of being transferred between two e-CNY wallets even when the paying and receiving terminals are both offline, and neither being associated with a bank account –

- **Dual offline payment**
  According to the patent obtained by the People's Bank of China's Digital Currency Research Institute, e-CNY can realise offline payment through e-CNY chipcards. Specifically, the paying wallet terminal device can use a near-field wireless connection method – such as Bluetooth, infrared, near-field communication ("NFC") – to transfer the transaction amount to the acceptance terminal device even without an established connection between the two devices;[18] the acceptance terminal device will then send the transaction information to the e-CNY system of the bank hosting the e-CNY wallet once it establishes an internet connection. Such hosting bank system will then update the PBoC's e-CNY system with such information to reflect the change in the ownership of the transacted e-CNY.

- **Loosely coupled account links**
  Users could use e-CNY anonymously with counterparts in daily transactions, but operating agencies would be required to submit transaction data to the PBoC via asynchronous transmission on a timely basis.[19] In this way, users remain anonymous to each other, but allow the PBoC to keep track of necessary data to implement prudent regulation, detect illegal activities, and ease the workload for commercial banks.[20] To resemble the functions of cash, e-CNY allows those who do not have bank accounts an access to an 'unauthenticated' e-CNY wallet. For the purposes of risk management (e.g., addressing money laundering and terrorist financing concerns), an unauthenticated e-CNY wallet is entitled to only daily micropayment needs, while upgrading transaction limits would require users to upload an identity card or a bank card.[21]

[15] 中国金融,《中国法定数字货币原型构想》, September 2016. (in Chinese only)
[16] See footnote 10.
[17] Ibid.
[18] The terminal device carrying the paying wallet needs to support the trusted execution environment ("TEE"), the transaction information needs to be verified through TEE for checks against the double-spending problem.
[19] YiCai Global, Some thoughts on CBDC operations in China, April 2020.
[20] Ibid.
[21] See footnote 10.



CBDCs work by other national central banks

While China is making steady progress in developing its digital sovereign currency, there are moves afoot to make it a global phenomenon. According to a survey conducted by the Bank for International Settlements ("BIS") and responded by 66 central banks, some 80% of the central banks were engaging in some sort of work in relation to CBDCs, with half looking at both wholesale and general (or retail) purposes CBDCs.[22] Wholesale-based CBDCs were mainly used for very large money transactions among banks and other relevant institutions, whereas retail-based CBDCs had a focus on the needs of the public individuals, being used for daily consumption. More notably, about 40% of responding central banks have progressed from conceptual research to the experimental or proof-of-concept stage; plus, another 10% have commenced their pilot projects.[23]

Across the different workstreams internationally, jurisdictions that have issued their CBDCs include Ecuador and Venezuela and they mainly do so for purposes such as enhancing financial inclusion, although in certain cases they have also pursued a CBDC strategy to reduce dependence on certain other currencies. More recently, Cambodia's "Bakong" platform was launched in October 2020 to support transactions in USD and Cambodian riel utilising a digital token, although it remains in question as to whether this is, in fact, a CBDC. However, market response and public usage and awareness are limited. Meanwhile, other economies such as France and Singapore are entering the pilot stage; and Sweden is conducting live testing of its e-krona with retailers in a bid to find a safe and efficient digital payment system.[24] In October 2020, the Bank of Japan announced a number of principles for a potential "general purpose" CBDC (without necessarily excluding a wholesale version) and that it would be commencing a proof-of-concept phase early in its 2021 fiscal year.[25]

[22] Bank for International Settlements, Impending arrival – a sequel to the survey on central bank digital currency, January 2020.
[23] Ibid.
[24] Sveriges Riksbank, E-krona, December 2019.
[25] Bank of Japan, "The Release of "The Bank of Japan's Approach to Central Bank Digital Currency" available at https://www.boj.or.jp/en/announcements/release_2020/rel201009e.htm/.

CBDC Projects of some overseas jurisdictions

Currency/Project	Status	Architecture	Users
Canada's Project Jasper	Pilot	Hybrid	Wholesale
Ecuador's Dinero Electronico	Decommissioned	Centralised	Retail
France's Digital Euro	Pilot	Hybrid	Wholesale
Japan's CBDC	Proof of concept (2021)	Not yet fixed	General purpose
Singapore's Project Ubin	Pilot	Hybrid	Wholesale
South Africa's Project Khokha and CBDC Feasibility Project	Pilot	Hybrid	Multiple options considered
Sweden's e-krona	Live testing	Hybrid	Retail
Switzerland's Project Helvetia	Proof of concept (2020)	Distributed ledger	Wholesale
Thailand's Project Inthanon	Pilot	Hybrid	Wholesale
Venezuela's Petro	In circulation	Hybrid	Retail

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COVID-19 has brought the discussion about (and expectation for) CBDCs to a more heated level. For instance, in April 2020, the BIS remarked that resilient payment infrastructures including retail CBDCs would become more prominent, in view of, amongst others, the public concern about the possibility that coronavirus may spread through cash. It also foresees that CBDCs would need to be designed in a way to allow for access options for the unbanked and (contact-free) technical interfaces suitable for the whole population.

Research on CBDCs in Hong Kong

Hong Kong commenced its CBDC research in 2017 – the Hong Kong Monetary Authority ("HKMA") led the Hong Kong Dollar ("HKD") note-issuing banks to launch Project LionRock, a proof-of-concept study to conduct research and better understand the potential advantages and challenges of DLT in the case of wholesale CBDC applications.[26] Particularly, the project included a proof-of-concept study on a token-based CBDC and debt securities issued into a single DLT system.[27]

Through the in-depth analysis conducted, Project LionRock has demonstrated the feasibility of utilising DLT to conduct CBDC issuance and its atomic delivery-versus-payment ("DvP") transactions.[28] It is also believed that CBDCs have the potential to require fewer intermediaries and settlement layers than what is required in the traditional banking payments system. Against this background, the HKMA decided to expand the research scope to cross-border funds transfer and foreign exchange settlements. This paved the way to the subsequent collaboration with the Bank of Thailand, which also has carried out similar study on CBDCs in the domestic context (via its Project Inthanon).

The joint initiative between the Bank of Thailand and the HKMA has taken the form of Project Inthanon-LionRock. Launched in September 2019 and completed in December 2019, the first phase of the Project Inthanon-LionRock sought to build a proof-of-concept in which a THB-HKD regional corridor network was set up as a bridge between the Inthanon and the LionRock networks (DLT based local payment network of each jurisdiction).[29] Initially built on a R3's blockchain platform Corda, the corridor network allowed Inthanon and LionRock network participants to conduct funds transfers and foreign exchange transactions on a peer-to-peer basis, thus reducing settlement layers; the corridor network also aimed at facilitating banks' foreign currency liquidity management, adopted the liquidity saving mechanism for multiple currencies and incorporated compliance to local regulations where appropriate.[30] Other key findings of the proof-of-concept project, covering topics such as token conversion, real-time interbank funds transfer, foreign exchange execution, liquidity management and regulatory compliance, were set out in the report published by the two authorities in January 2020. The report also set out future considerations – in legal, operational and technical aspects – for the central bank community's reference. The two authorities indicated that they would proceed with further collaborative research work in relevant areas, including exploring business cases and connections to other platforms, involving participation of banks and other relevant parties in regional funds transfer trials.[31]

The second phase of the Project Inthanon-LionRock, currently in progress, aims to explore business use cases in cross-border trade settlement and capital market transactions. The project also intends to enhance the cross-border corridor network prototype to support CBDCs of other central banks in the region. At present, the Hong Kong Exchanges and Clearing Limited, 19 participating banks, and five other corporates are going to participate in the project which involve trials using actual trade transactions. The project findings are expected to be delivered in Q1 2021.[32]

As this paper shows, some four-fifths of the central banks have undertaken some work relating to CBDCs. Noting that relevant developments will have much impact on the delivery of financial services in the future, the Financial Services Development Council will continue to research on FinTech-related initiatives and communicate with relevant stakeholders.

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[26] Hong Kong Monetary Authority, Project Inthanon-LionRock, January 2020.
[27] Ibid.
[28] According to the HKMA's Guide to Hong Kong Monetary, Banking and Financial Terms, DvP refers to "a securities delivery arrangement in which the delivery of securities takes place as soon as payment is made for them and confirmed final and irrevocable".
[29] Ibid.
[30] Ibid.
[31] Hong Kong Monetary Authority, The Outcomes and Findings of Project Inthanon-LionRock and the Next Steps, January 2020.
[32] Hong Kong Monetary Authority, Hong Kong FinTech Week 2020, November 2020.

About the FSDC

The FSDC was established in 2013 by the Hong Kong Special Administrative Region Government as a high-level, cross-sectoral advisory body to engage the industry in formulating proposals to promote the further development of the financial services industry of Hong Kong and to map out the strategic direction for the development.

The FSDC has been incorporated as a company limited by guarantee with effect from September 2018 to allow it to better discharge its functions through research, market promotion and human capital development with more flexibility.

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