

CBDCs— part1

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The words of the African leader in Paris, "*Why can't we trade in our own currencies?*" triggered the long going debate about the dollar dominance¹ [1,2] where people discuss the effect of **BRICS** (trading agreement between Brazil, Russia, India, China, South Africa), or trading using Chinese Yuan, or....etc. However, I think it's not quite a real solution if you replace the intermediary dollar exchange with another currency Z when trading between countries with currencies X&Y; yes it will create some balance to distribute power between a number of currencies instead of just one, but why do we need an intermediate currency?

In 2021, Oliver Wyman & JPMorgan released a report [3] that estimates about 120b\$ goes annually to bank fees from world's annual cross-border trades of nearly 24T\$; add to this other hidden costs due to delay and trapped liquidity as earlier mentioned by Bank of London[4] advising the use of CBDCs . Also, the Bank for International Settlements (BIS)' 2021 annual report define among the main benefits of CBDCs [5]

"Addressing the consequences of a decline in cash; providing a building block for better, faster and more secure cross-border payments"

So, are those African countries in their way to deploy CBDCs?

What are exactly CBDCs?Is it really a savior solution to some financial problems?or is it just a technology FOMO² bubble that everyone is trying to catch???

-They say even CBDCs have smaller carbon footprint than the card payment system, have you heard that?!

This first article will try to explore CBDCs and gives you overview answers; following articles may dive deeper into CBDCs.

What are exactly CBDCs?

Short and simple, CBDC is a form of digital money issued and controlled by central banks [6,7,8]; see Fig.1 for a quick glance.Then follow me in interpreting this short sentence word by word to conclude:

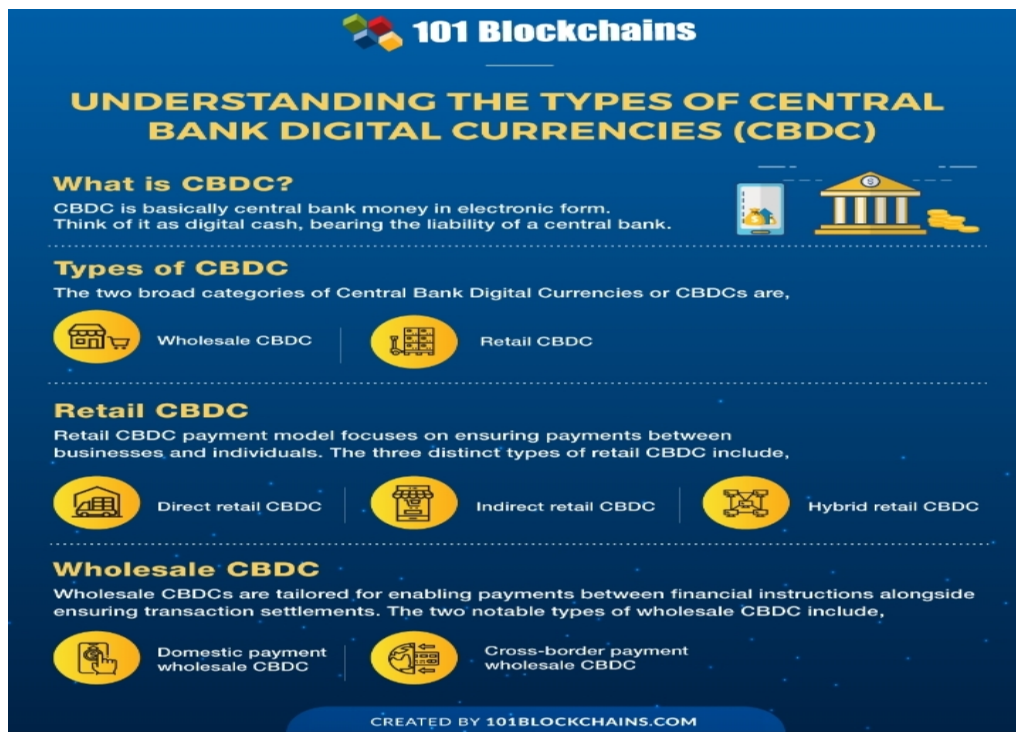


Fig.1 a quick glance on CBDCs

-You could say it's similar to a crypto or a stable coin, with the CB in place of the issuing DAO; in fact the idea emerged from JPMorgan released stablecoin [9].

-Since it's issued by Countries CBs, it is custodial, possibly permissioned, and centralized. Some may feel more safe when the government is the issuer, others may have the same fears they had with fiat currencies; banks will know the identity and could have some control on your money or even in giving you the permission to join.

-Since it's digital money, it's programmable in principle, with the possibility of coding spending or blocking conditions (like slashing conditions in Ethereum POS, or even bad behavior penalties in a game)

-The similarity with stable coins and cryptocurrencies opened up the space for their design decisions on the CBDC infrastructure [8]; like the possibility of token or UTXO-based Vs the normal banking convention of account-based; a Virtual Machine architecture, possibly EVM-like to facilitate programmability. However, implementing CBDCs using blockchains as an infrastructure, commonly called Distributed Ledger Technology DLT, is not necessarily banks favorite choice [6,7].

Getting into banking details, banks perform different kinds of financial transactions; although

this article started by discussing cross-border payments, this is not the only kind that could be handled by CBDCs. This important design decision, including possible design levels, is summarized in Fig.2.

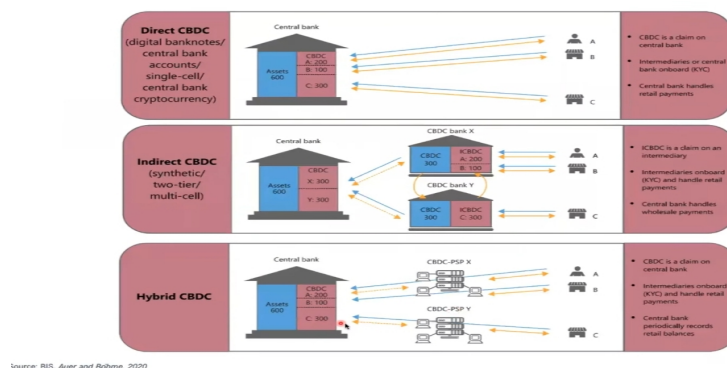
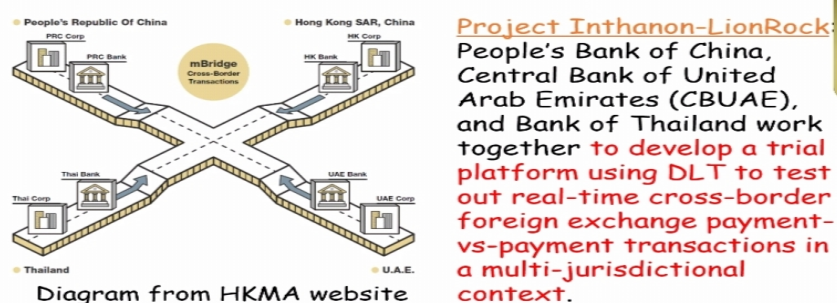


Fig.2: CBDC transactions scope, copied from [6], cross-reference to BIS 2020

If banks will interact with citizens in a form of retail CBDC, or even in international payments worldwide, there will be scalability issues since there will be a huge traffic of transactions to handle.

-Finally, since CBDCs are issued by central banks, and each country have a CB, there will be significant issues [8,10] of interoperability (how will different designs interact, would it be something like cross-chain bridges in DeFi or will everyone agree on standard simple format for all cross-CBDCs TXs, these are open questions whom I'm not aware clear answers exist) and exchange or swap (what will define the exchange rate between the CBDC of country X & that of country Y?). Uptill now, some countries may decide to join into one CBDCs for all their Central Banks, like the BRICs; others may decide to have their own CBDC, like Jamaica or Nigeria; and some others decided to conduct a special channel between their countries as a beginning pilot experiment, like China-UAE-Thailand for example as illustrated in Fig.3.



Report:

- Inthanon-LionRock to mBridge: building a multi CBDC platform for international payments

Fig.3 a project for multi-CBDC interaction, China-UAE-Thailand, from [10]

Are CBDCs eco-friendly?

The *IMF* (International Monetary Fund) blog in [11] relies on their paper[12], which compares different Blockchain designs (Distributed Ledger Technology DLTs) POW, non POW, Permissionless, and permissioned to payment cards, and then assumes most CBDC designs to be permissioned (only authorized users can access the ledger) and definitely not using POW Nakamoto consensus, with other added security implications that may add extra energy consumption. Of course most of us knew that POS (and similarly any other non POW consensus) consumes less energy than POW, but I think fewer knew this is also less than card payment platforms.

Also, the researchers in [13] explored CBDC impact on environment and green finance; according to their empirical investigation of China CBDC pilot program, CBDC is found to decrease SO₂ emission, NO_x emission, Smoke emission, and improve green land ratio.

African Trading & CBDCs

-Before Paris conference, African leaders gathered into **AU-Summit** earlier this year under the title "*Year of AfCFTA: Acceleration of the African Continental Free Trade Area Implementation*"; if you read the whole article in [14] you will find no mention of CBDCs. However, another deal between the 2 companies yellowcard & Block created a inter-country network within 16 countries in Africa to facilitate cross-border payments using crypto assets (including USDC for dollar peg); the countries include Nigeria, Ghana, Kenya and South Africa [15], and probably Center Africa since it has already adopted Bitcoin as a main currency. Although the deal doesn't involve the deployment or mention the research on CBDCs³, it uses DeFi as an initial conceptual step, and is expected to be cheaper (below 1% cost as opposed to ~6% banking fees [16]) and faster than banks.

-Two African countries have already started their own CBDC projects; **Nigeria** through its new digital currency eNaira. Unfortunately, the Nigerian experience wasn't successful [17], but I think this is because they chose to implement a **Retail CBDC**, which is for everyday citizens transactions, so it inherited all the problems & complains occurred in countries deploying Bitcoin adding to it more complains of citizens rejecting governmental control on their spendings; unlike what some people may believe, I think retail CBDCs are too early for developing countries [18] since they need a much more solid network infrastructure, **Network readiness (N)** which [18] Table3 measure as 28.22%; more people usage of technology, **Human Development Index HDI**=0.539 and **Education**=0.499; also enough democracy for governments not to mis-use the programmability feature⁴, **Democracy (D)**=4.12. To compare, the paper measures N~77–80, E~0.9, HDI~0.9, D~8–9 for USA and UK. The **Ghana eCedi** CBDC is said to avoid some of

the design bottlenecks of the **eNaira** [16], although still retail, as it simply mimics cash with all the stakeholders in the traditional financial system maintaining their old roles (no DLT) ; in last March the Bank of Ghana announced that the pilot phase was completed⁵, but the launch will be delayed [19].

-On the other hand, **Wholesale CBDCs** which facilitates cross-border payments between countries doesn't have to tackle those problematic issues faced by retail. The most famous African involvement in a wholesale CBDC is South Africa being part of BRICS; yet there are more coming in the way. **South Africa** is also collaborating with Australia, Singapore and Malaysia to test the use of CBDCs for international settlements; ie., experimenting interoperability solutions.

-**Tunisia** started a pilot wholesale CBDC with Bank of France in 2021 [20], while cancelled its earlier plans of launching a retail eDinar in 2019.

-According to [16] & [21] there are 15 other countries in the research phase including **Botswana** (PosoMoney), **Kenya** (Huduma Namba), **Zimbabwe**, **Uganda**, **Zambia**,... and more.

Egypt

-As of Egypt, my country, the CBDC tracker [23] records an earlier statement in 2018 about starting research referenced only through a medium article by security token advisors [24] which I wasn't sure what is the article reference; however a newer clearer 2023 statement was published in Daily News Egypt [25] (although still couldn't track it back to the original statement at CBE site).

-Also, there is a confirmed news [26] that Egypt request to join the **NDB**, New Development Bank an institution created by the BRICS, was approved and will be official in August; UAE and Saudi Arabia was approved too.

CBDCs in Middle East & Arab Countries

-The **UAE** experiments is the richest no doubt, part of it was discussed in [10] and maybe needs a separate article to cover all pilots; one project called Aber was with Saudi Arabia. -After the success of Aber, SAMA, their Central Bank, announced it's experimenting a CBDC pilot with local banks and fintech companies to explore risks and benefits; however the Saudi Media agency stressed that the decision to introduce a CBDC into economy is still pending[27].

-**Jordan** has started considering cross-border CBDCs instead of just retail with the encouragement of the IMF [28]. -African Arab countries were covered above.

CBDCs Worldwide

According to the world wide CBDC trackers I could find [23,29], and the chainalysis 2023 report [30] about 98% of the world countries,130, are in some stage, 10 of which have already launched some form of CBDCs; earlier ones include **China**, the **Bahamas**, **Jamaica** and most of the Caribbeans CBs.

-Among the most important international projects, we mentioned **BRICS**, UAE pilot projects.

-The **USA** has 2 running research projects:

- ★ **MIT dci** (Digital Currency Initiative) open source CBDCs experiment project [31], **Hamilton**, with CB of Boston, then an exploratory research with Bank of England (which has an earlier wider research of its own [32]), and also Bank of Canada (holded an international summit last May, on which the eCedi of Ghana was discussed as mentioned above). MIT faster design achieved 1.7 million transactions per second, and the project aimed to expand financial inclusion (retail) and left interoperability to later stages.
- ★ On the other hand, **NYIC** (New York Innovation Center), **Cedar**, project targeted a solution for wholesale FX settlement [33]. A simulation experiment was conducted with the Monetary Authority of **Singapore** (MAS) to test efficiency and interoperability of DLT based solutions [34]; the experiment was considered successful with average below 30 secs for end-to-end settlements, and both ledgers customizing their design and operation to communicate without the need of a central authority or network⁶.
- ★ Note that both USA projects are based on blockchains (DLT), as opposed to e-currency designs that use traditional distributed databases with central authority (recall the 2-tier design in Fig.2) that were deployed in Ghana and Jamaica [21].

-Most **European** countries are in advanced steps; France, Zurich,...etc; and there's also the digital Euro⁸ project launched by Eurosystem.

-**Australia's** eAUD pilot project was not cancelled, it is still going on with New Zealand and is expected to wrap up by the end of this year; the pilot projects include also Mastercard, Monoova, the Australian Bond Exchange, DigiCash, Commonwealth Bank and others.[35].

-Finally, It's also worth mentioning that the dis-anonymity of CBDCs make it more appealing to Anti-Money-Laundry **AML** than crypto.

-Fig.4 summarizes the world Status regarding CBDCs from the **World Economic Forum** report in June 2023 [36]; newer versions will keep on appearing with every change. It's also worth mentioning that the report include newer values for a variety of metrics like those we discussed before that affect the successful adoption of CBDCs.

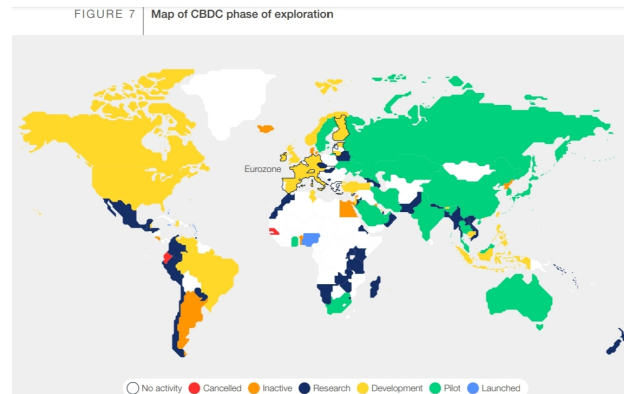


Fig.4: CBDC status worldwide as stated by the June 2023 World Economic Forum report [36]

Closure & Final Remarks

CBDCs have gained a worldwide attention in the last few years; the interest include international financial institutions like IMF [11,12,28,37], BIS [5], IRSG [38]; 98% of worlds central banks uptill now; international database designer companies like e-currency [21]; and also researchers & research institutes around the world spanning a wide variety of research areas [6,7,8,10,13,39,40,41,42].

In this article, I tried to provide the reader with a broad understanding of what are CBDCs, their benefits especially in cross-border payments, the main research areas involved their design, and finally the status quo of CBDCs in different countries around the world, especially Africa (motivated by the African leader statement in Paris). I plan to write following articles in the subject that gives more in-depth survey and/or analysis of some of the many research areas & design decisions in CBDCs.

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Footnotes

1- The USA congress did made a hearing session about it this June (<https://geopoliticeconomy.com/2023/06/20/us-congress-dollar-dominance-hearing/>); one floating question I have in mind what will happen if they launched their CBDC and joined the competition with another product.

2-*FOMO* stands for the Fear Of Missing Out important opportunities, which might drives you to buy something you don't actually need; similarly deploying a technology that is not that beneficial to your company/country. (<https://www.avenga.com/magazine/fear-of-missing-out-in-tech-it/>, <https://www.techtarget.com/whatis/definition/FOMO-fear-of-missing-out>).

3-The BRICS group started in almost the same way in 2001, as a financial collaboration group, before CBDCs or even crypto existed (<https://en.m.wikipedia.org/wiki/BRICS>).

4-The MIT paper presented in (<https://youtu.be/Xkbh6kmVmdQ>) is also a valuable resource if you want to read about analysis of people impressions about retail CBDCs and their possible impact on financial inclusion.

5-For the design details of Ghana eCedi, you may read their report in Canada Payment Summit (<https://www.finextra.com/newsarticle/42273/payments-canada-summit-ghanas-ecedi-pilot>), or find their white paper for more; infact there's like an infinite source material for CBDCs comparative studies.

6-UAE with R3 G42 cloud and Clifford Chance (<https://ffnews.com/newsarticle/central-bank-of-uae-launches-cbdc-implementation-strategy-in-collaboration-with-r3-g42-cloud-and-clifford-chance>).

7-Maybe in a following article we could compare different interoperability solutions used in different pilot experiments, for example the *HKMA* project described in Fig.3 with this one.

8-More details can be found in the official site (<https://home.digital-euro-association.de/cbdc/en>).

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Cbdc

Crossborder Payments

Finance And Banking

Brics

Blockchain Technology