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Alternative Opportunities for Advancing the Sustainable Development Goals?

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Cryptocurrency in Africa:

Alternative Opportunities for Advancing the Sustainable Development Goals?

by Ankun Liu, Orria Goni and Aiaze Mitha[1]

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Abstract

The compounding crises of the COVID-19 pandemic, unchecked climate change and the war in Ukraine have caused severe negative economic, social and environmental consequences across the globe. We are facing a risk of a sharply diverging world with inequalities widening between developed and developing countries and within developing countries themselves, between urban and rural areas, rich and poor, men and women. This is especially true for the African continent, which has already suffered a loss of almost a decade of development gains. But, consistent with the findings of the UN Secretary-General's Task Force on Digital Financing 'People's Money: Harnessing Digitalization to Finance a Sustainable Future',[2] the pandemic has put a spotlight on the role of digital finance and its accelerated applications in response to the crisis. A key question in this regard is how to use digital finance to improve economic participation, agency and resilience of people, facilitate cross-border trade and support sustainable development while addressing the risks of the widening digital divide. This paper will present the emerging applications of cryptocurrency in Africa, examine the evolving regulatory landscape and key accompanying risks and suggest potential policy considerations for leveraging this nascent, innovative instrument towards the advancement of the sustainable development goals (SDGs) in the continent.

[2] UN Secretary-General's Task Force on Digital Financing of the SDGs (2020). People's Money: Harnessing Digitalization to Finance a Sustainable Future. https://unsdg.un.org/resources/peoples-money-harnessing-digitalization-finance-sustainable-future.

Introduction

The COVID-19 pandemic has battered the entire world, including the already vulnerable African continent, resulting in many years of development setbacks. Climate change remains unchecked, posing huge challenges for developing and vulnerable countries in addressing loss and damage, building resilience, and moving towards green and fair transitions on their development paths. The war in Ukraine has caused adverse effects—such as supply chain and trade disruptions, food and energy price spikes and rising inflation—across a world already hammered by COVID-19 and climate change, with dramatic and disproportionate impacts on developing countries and vulnerable households.

In this difficult context of compound and complicated crises, digital technologies and digital finance prove to be effective in providing relief for millions around the world, supporting businesses and protecting jobs and livelihoods. As digital technologies transform our economies and societies globally, the world is seeing opportunities in this shift towards digital economies to drive inclusive growth and innovation. The disruptive potential of digitalization in transforming finance is immense and growing at an accelerated pace, as we are currently witnessing with the volatile but speedy growth of the global cryptocurrency market, particularly in the past two years. The total market capitalization of cryptocurrencies has increased dramatically from $18 billion in 2017 to over $2 trillion in 2021.[3] The market cap then dropped to $1 trillion by September 2022.[4] Similar to the fall of asset prices seen in traditional financial markets during the same period, this market cap drop was inextricably linked to the aggressive interest rate hikes implemented to curb high inflation by central banks around the globe since the end of 2021, especially the US Federal Reserve.[5] The evolving trend described above is also well reflected by the top 10 cryptocurrencies in **Figure 1**, which represented 75-88% of the total market cap during the illustrated period.[6]

Cryptocurrencies are digital assets or digital representations of value that depend on distributed ledger technology such as blockchain. Cryptocurrencies can offer new opportunities for promoting sustainable development such as provision of innovative and inclusive financial services to underbanked/unbanked people; facilitating fast, easy and cheap digital payments; bringing new areas for tax revenue; ensuring safer store of value in some cases; and supporting biodiversity protection. Along this line, the usage of cryptocurrencies could support the contribution to the achievement of sustainable development goals (SDGs) such as SDGs 1 (no poverty), 5 (gender equality), 8 (decent work and economic growth), 10 (reduced inequalities), 11 (sustainable cities and communities), 14 (life below water), 15 (life on land) and 17 (partnerships for the SDGs). However, it is also important to underline that with opportunities come core challenges and risks.

This paper, therefore, will aim at bringing a pragmatic approach to cryptocurrencies,[7] with a geographic lens on Africa, focusing not only on opportunities that they could bring for the financing for development agenda but also on potential and collateral risks.

[3] See CoinMarketCap: https://coinmarketcap.com/charts/; IMF (2021). Global Financial Stability Report—COVID-19, Crypto, and Climate: Navigating Challenging Transitions. Washington, DC, October. https://www.imf.org/en/Publications/GFSR/Issues/2021/10/12/global-financial-stability-report-october-2021; and Iyer, T. (2022). Cryptic Connections: Spillovers between Crypto and Equity Markets. IMF Global Financial Stability Notes, No 2022/001. https://www.imf.org/en/Publications/global-financial-stability-notes/Issues/2022/01/10/Cryptic-Connections-511776.

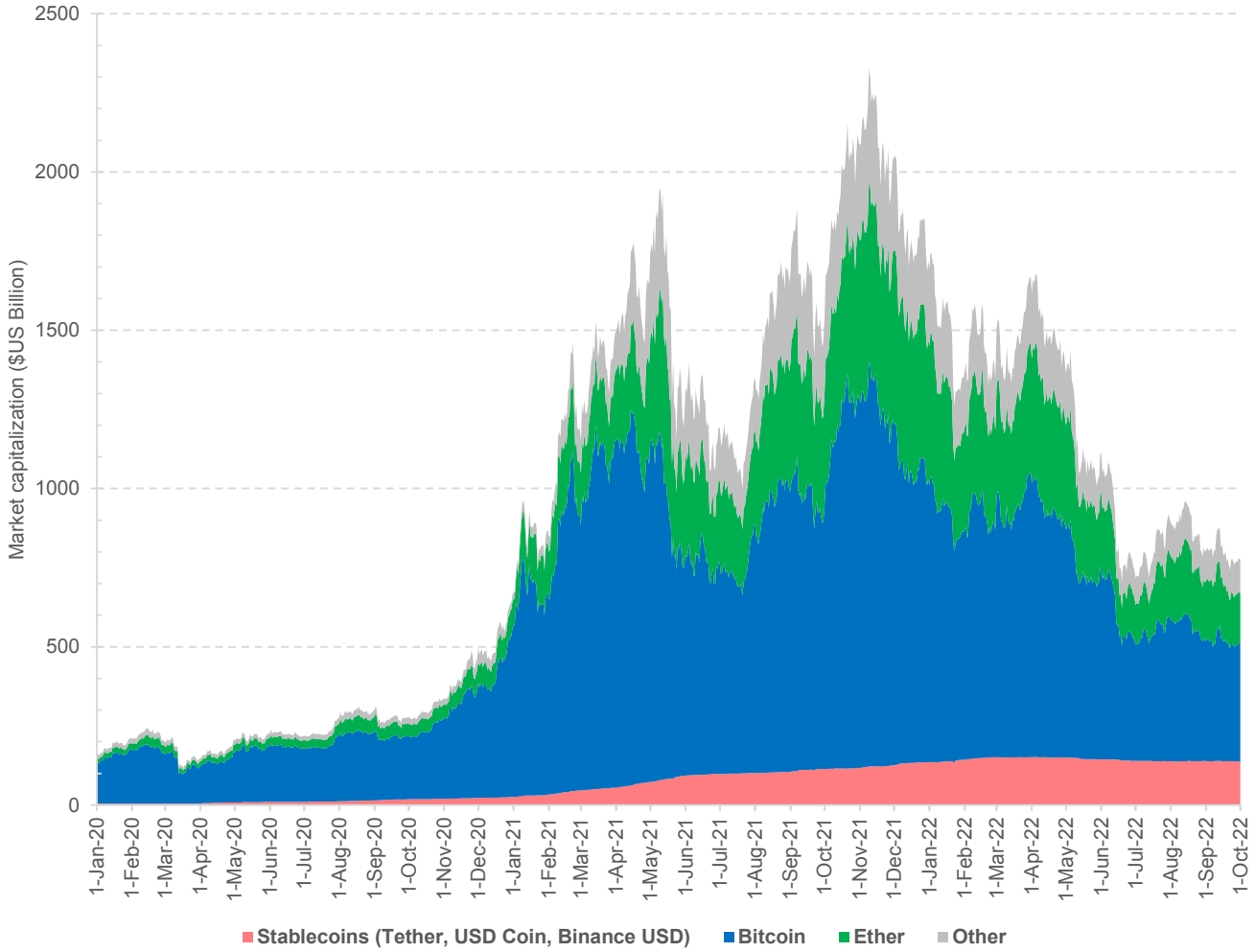
[4] See CoinMarketCap: https://coinmarketcap.com/charts/ and CoinGecko: https://www.coingecko.com/.

[5] See Adrian, T., and Natalucci, F. (2022). Central Banks Hike Interest Rates in Sync to Tame Inflation Pressures. IMF blog. https://www.imf.org/en/Blogs/Articles/2022/08/10/central-banks-hike-interest-rates-in-sync-to-tame-inflation-pressures; Choueiri, N., Gulde-Wolf, A.M., and Iyer, T. (2022). Crypto Is More in Line with Asian Equities, Highlighting Need for Regulation. IMF blog. https://www.imf.org/en/Blogs/Articles/2022/08/21/blogs-crypto-asian-equities-082122; and US Federal Funds rate hikes: https://tradingeconomics.com/united-states/interest-rate.

[6] See CoinMarketCap: https://coinmarketcap.com/charts/ and CoinGecko: https://www.coingecko.com/.

[7] The cryptocurrencies in this paper refer to those issued by the private sector based on blockchain technology, which are not regarded as legal tender by most countries. It is important to note that the aspect of central bank digital currency (CBDC), which is a digital fiat currency but may or may not use blockchain technology, is beyond the main discussion scope of the paper and will be only lightly touched on.

Figure 1: Market capitalization evolution of top 10 cryptocurrencies



Source: Based on data from CoinGecko as of 1 October 2022.[8]

Note: The largest 10 cryptocurrencies included in the graph are Bitcoin, Ether, stablecoins (Tether, USD Coin, Binance USD), and other (BNB, XRP, Cardano, Solana, and Dogecoin).

[8] CoinGecko: https://www.coingecko.com/.

Potential of cryptocurrency for SDGs' advancement

1

1.1 Improving financial inclusion

Most of the population living in the Sub-Saharan Africa (SSA) region is still 'unbanked' or underserved by traditional financial services. In 2021, 60% of the region's population above 15 years old had no financial institution accounts (compared with 26% of the global population), with the share of women without a bank account 12 percentage points higher than men without a bank account.[9] There are 4.5 commercial bank branches per 100,000 adults in Sub-Saharan Africa, much lower than the global average of 10.8.[10] Typical barriers to traditional financial access include the expense of financial services, distance to financial institutions, financial illiteracy, lack of necessary documentation and collateral requirements.

Thanks to the rapid progress in digitalization over the past years, the financial inclusion level in the region has improved to some extent. In this line, as shown in **Figure 2**, the mobile phone penetration rate among adults has grown significantly, with a regional coverage of 75% on average. It is further projected that average smartphone connections in the region will account for 61% of total mobile phone connections by 2025, a rapid rise from adoption rates of 44% in 2019 and 49% in 2021.[11] Moreover, the increasing share of mobile money accounts among adults enables more unbanked or underserved people to have alternative access to finance. This is evidenced in **Figure 2** by the generally negative correlation between the trend of mobile money account ownership and the trend of adults without any financial institution or mobile money accounts. In other words, countries that have higher shares of mobile money accounts tend to have higher levels of financial inclusion (i.e., lower levels of financial exclusion).

The overall high penetration rate of mobile phones, the strong uptrend of smartphone connections and the ever-growing ownership of mobile money accounts allow for relatively low transition costs and lay a good foundation for the emerging adoption of cryptocurrencies in Sub-Saharan Africa to further improve financial inclusion and financial access for goods and services needed for the unbanked/underserved population and micro and small businesses. Leveraging cryptocurrency solutions through mobile phones could lower some of the barriers to financial inclusion seen in traditional financial services, if coupled with improved digital and financial literacy. One can register accounts via mobile phones to send, receive, spend and convert cryptocurrencies with minimal transaction costs and requirements of documentation and collateral, regardless of the physical distance to financial service providers and the gender of account owners.

For example, Kenya's Bitcoin payment service provider, BitPesa, partnered with a German peer-to-peer Bitcoin online lender, Bitbond, to facilitate access to financing: micro, small and medium-sized enterprises (MSMEs) could apply for small business loans from Bitbond based on credit score and business information and have their tokenized loans paid through BitPesa into a local currency mobile money account or bank account in as little as 20 minutes. The initiative was rolled out in Kenya, Nigeria, Uganda and Tanzania.[12] Another example is Nigeria's SureRemit, a remittance service provider using blockchain and its in-house crypto token, RMT, to facilitate remittance transfers to home countries from the global diaspora. The company hosts a global network of over 1,000 merchants and partners; African e-commerce giant Jumia is

[9] Demirgüç-Kunt, A., Klapper, L., Singer, D., and Ansar, S. (2022). Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19. Washington, DC: World Bank. https://www.worldbank.org/en/publication/globalfindex.

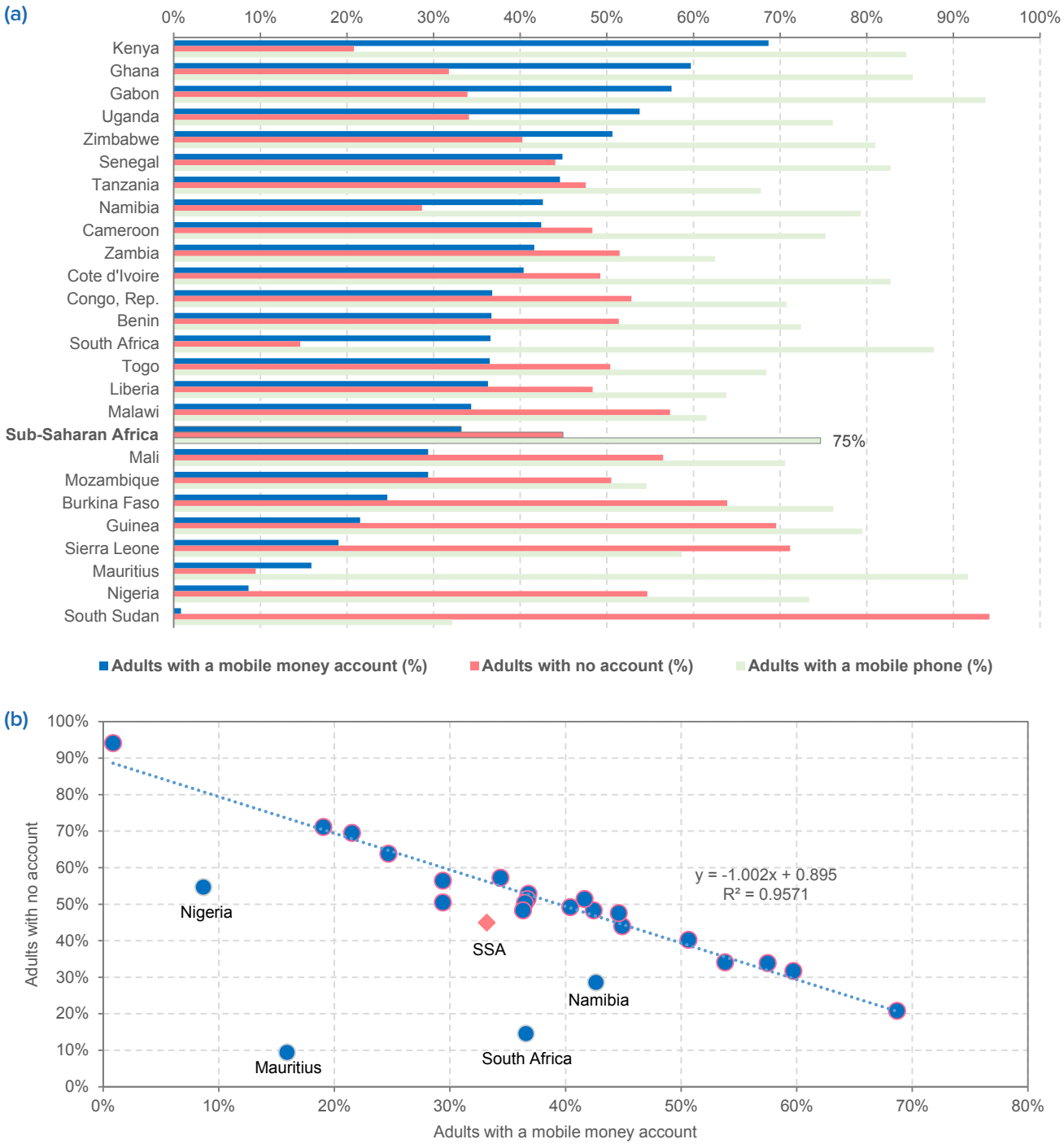
[10] World Bank database: https://data.worldbank.org/indicator/FB.CBK.BRCH.P5?end=2020&locations=ZG-1W&start=2004&view=chart.

[11] See GSMA (2022). The Mobile Economy Sub-Saharan Africa 2022. https://www.gsma.com/mobileeconomy/wp-content/uploads/2022/10/The-Mobile-Economy-Sub-Saharan-Africa-2022.pdf; and GSMA (2020). The Mobile Economy Sub-Saharan Africa 2020. https://www.gsma.com/mobileeconomy/wp-content/uploads/2020/09/GSMA_MobileEconomy2020_SSA_Eng.pdf.

[12] See International Finance Corporation (2019). Blockchain: Opportunities for Private Enterprises in Emerging Markets, Second Edition. Washington, DC: International Finance Corporation: https://openknowledge.worldbank.org/handle/10986/31251; web news: https://ventureburn.com/2017/03/bitpesa-partners-with-bitbond/; and for loan application details: https://fortunly.com/reviews/bitbond-review/.

among this network. Users can buy and transfer the cryptocurrency RMT for real-life goods and services for the unbanked population, with options to remit vouchers and gift cards, buy consumer goods, pay utility bills and student tuition, send airtime top-ups and donate to charity at low cost and high speed.[13]

Figure 2: Financial inclusion and mobile phone ownership in Sub-Saharan African countries



Source: Based on data from Global Findex database 2021.[14]

Note: Adults with no account—no financial institution account or mobile money account. The regression line excludes country data of Namibia, South Africa, Mauritius and Nigeria where financial institution account ownership dominated the contribution to financial inclusion.

[13] See SureRemit website: https://sureremit.co/.

[14] Demirgüç-Kunt, A., Klapper, L., Singer, D., and Ansar, S. (2022). Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19. Washington, DC: World Bank. https://www.worldbank.org/en/publication/globalfindex.

Although current cryptocurrency adoption still skews male, a 2022 report by Gemini based on global surveys suggests more women in developing countries are engaging with cryptocurrency and the gender gap in cryptocurrency may be narrowing.[15] In the three African countries surveyed (Kenya, Nigeria and South Africa, with a sample size of 1,200-plus respondents in each country), 41% to 50% of the cryptocurrency users are women. Moreover, 46% to 57% of the cryptocurrency-curious people in the three countries are women who are either interested in learning more or are likely to use cryptocurrency in the next year.

In SSA, one key question pertinent to leveraging cryptocurrency for expanding financial inclusion is: Will it be hard for mobile money users, especially those who use feature phones to explore the use of cryptocurrencies? Despite the rapid growth of mobile phone penetration, about half of the mobile phones in the region are still feature phones, which do not support advanced mobile applications such as most smartphone cryptocurrency apps. The big advancement of mobile money in SSA is primarily driven by payment technology based on unstructured supplementary service data (USSD), short text codes that enable mobile transactions on both feature phones and smartphones without the need for the internet. Innovative solutions that connect cryptocurrency with USSD and work on any phone are thus needed. Such solutions, in fact, are already working in Africa. For instance, Machankura, which currently works in nine African countries, uses just USSD codes and phone numbers to create Bitcoin mobile wallets on the Layer 2 Lightning Network blockchain on top of Bitcoin to enable instant, cheap and micro transactions of Bitcoin.[16] Through Machankura, people can make instant payments including receiving and sending Bitcoin and buying goods and services such as airtime, electricity and shopping vouchers. Kenya-based Kotani Pay also offers a USSD-cryptocurrency solution that works on any mobile phone. It enables users to send and receive stablecoin cryptocurrencies and cash out stablecoins to bank and mobile money accounts in local currencies.[17]

In improving the financial inclusion of individuals and businesses, some considerations may be important for the design of cryptocurrency solutions: educational resources on digital finance and cryptocurrency; payment methods (online/offline, QR codes, etc.); interoperability with existing payment ecosystems; expansion of accessibility and utility; network of merchants with acceptance of cryptocurrency payment; network of service providers for crypto-local currency/cash exchange; custodial or non-custodial options for the security of accounts; and level of anonymity.

1.2 Facilitating cross-border trade

The implementation of the African Continental Free Trade Area (AfCFTA), which started in January 2021, will help Africa drive its economic transformation and recover from economic contractions associated with COVID-19 through enhanced intra-African trade. The AfCFTA will particularly benefit MSMEs, which predominate economic activity in African countries by boosting productivity and output and increasing revenues and jobs creation. Trade finance is important for importing and exporting enterprises. Bank-intermediated trade financing accounted on average for 40% of the total African trade in the past decade.[18] However, bank-supported trade finance has steadily declined due to more stringent regulatory requirements on know your customer (KYC), anti-money laundering (AML) and risk-based capital, disproportionately reducing support to MSMEs.[19] Other factors, such as liquidity constraints, currency risk, credit risk and time and monetary costs, also add to the challenges in financing trade in Africa.[20]

There is no single best solution that can address all these challenges around trade finance. Although still nascent, cryptocurrencies, together with other blockchain-based technologies (e.g., smart contracts), can

[15] Gemini (2022). 2022 Global State of Crypto Report. https://www.gemini.com/state-of-crypto.

[16] See Machankura website: https://8333.mobi/; and its user guide: https://8333.mobi/machankura/user-guide. The nine African countries where Machankura currently operates are Ghana, Kenya, Malawi, Namibia, Nigeria, South Africa, Tanzania, Uganda and Zambia.

[17] See https://docs.kotanipay.com/ and https://kotanipay.com/.

[18] African Development Bank (AfDB) and African Export-Import Bank (Afreximbank) (2020). Trade Finance in Africa: Trends over the Past Decade and Opportunities Ahead. Abidjan: AfDB. https://www.afdb.org/en/documents/trade-finance-africa-trends-over-past-decade-and-opportunities-ahead.

[19] Afreximbank, UNECA, AfDB and MFW4A (2021). Survey of Impact of COVID-19 on African Trade Finance. Cairo: Afreximbank. https://media.afreximbank.com/afrexim/Survey-of-Impact-of-COVID-19-on-African-Trade-Finance.pdf.

[20] Li, G.X. (2020). How Currency Risk Management Can Boost Access to Trade Finance in Africa. Contemporary Issues in African Trade and Trade Finance (CIAT), Volume 6, Number 1. Cairo: Afreximbank. https://media.afreximbank.com/afrexim/CIAT-Vol-6-2020.pdf.

add value in partly improving trade finance services with higher efficiency and lower transaction costs.[21] The ability to make payments through cryptocurrency in as little as seconds enables more rapid movement of money along the supply chain, among buyers, shipping companies, sellers, etc. MSMEs in cross-border trade can then have faster access to finance from banks and other financial institutions for securing liquidity for businesses. One example of this is Ripple's cryptocurrency XRP and its cross-border payment network for hundreds of financial institutions globally.[22] XRP can bridge two local fiat currencies on either side of a cross-border transaction within three seconds at a small cost for financial institutions. Through Ripple's Line of Credit service, transactions can be completed using XRP at a locked-in exchange rate, and credit can be repaid later on a convenient schedule, thus securing upfront capital for processing trade payments.

It is noteworthy that, as with many other cryptocurrencies, transactions through XRP are subject to the risk of price volatility (see 2.4), although the fast transaction speed can buffer such a risk to some extent. One potential approach to hedging such a risk is the development of cryptocurrency derivatives (e.g., forward, futures, options, swaps) for institutional market players. The derivatives market is still small but growing. For instance, CME Group (based in the US) has developed a suite of cryptocurrency risk management products, including Bitcoin futures and options, Micro Bitcoin futures, Ether futures and options and Micro Ether futures; and BitMEX (based in Seychelles) offers perpetual swaps and futures contracts for a range of cryptocurrencies.[23]

Another option for facilitating cross-border trade is through stablecoin cryptocurrencies, which minimize the risk of price volatility, as seen in Bitcoin-like cryptocurrencies (see 2.4). Stablecoins keep their prices relatively stable by pegging value to that of a fiat currency or a basket of assets that may include fiat currencies, investment securities, commodities, etc.[24] Stablecoins pegged to the US dollar, such as Tether (USDT) and USD Coin (USDC) were reported in use for African MSMEs' international trade.[25] The growing decentralized finance (DeFi) system based on the use of cryptocurrencies, especially stablecoins, is already able to provide fast and accessible financial products and services such as credit and deposit. This untapped potential in trade finance could facilitate MSMEs in participating in the trade opportunities AfCFTA brings across the continent and in sub-regions of Africa, such as in the Economic Community of West African States (ECOWAS), the Southern African Development Community (SADC), the Intergovernmental Authority on Development (IGAD) in Eastern Africa, etc.

1.3 Lowering transaction costs in transfer of remittances and aid funds together with faster speeds

Remittances to Africa have been on a steady uptrend in the last two decades and have become one of the most important external financing inflows to Africa. They can be a lifeline for many households and offer huge potential to advance the achievement of the UN's 2030 Agenda for Sustainable Development at national and local levels. Although the COVID-19 pandemic caused a 12.5% decline to $43 billion in remittances to Sub-Saharan Africa in 2020, the remittance inflow rose by 14.1% and bounced back to $49 billion in 2021, demonstrating the resilience of remittances.[26] However, this potential is limited by the very high remittance costs in the region. Sub-Saharan Africa remains the costliest region for receiving remittances, despite its continuing decreasing trend over the past years (**Figure 3**). The regional average remittance cost of receiving $200 was 7.8% in Quarter 2 2022, much higher than the average costs of 4-6.4% for other regions around the world.[27]

[21] Euro Banking Association (2016). Applying Cryptotechnologies to Trade Finance: Information Paper. https://www.abe-eba.eu/media/azure/production/1549/applying-cryptotechnologies-to-trade-finance.pdf.

[22] See Ripple's website: https://ripple.com/ripplenet.

[23] See CME Group website for its cryptocurrency futures and options: https://www.cmegroup.com/markets/cryptocurrencies.html?redirect=/trading/cryptocurrency-indices.html#explore-our-cryptocurrency-products; and BitMEX website for its derivatives: https://www.bitmex.com/app/perpetualContractsGuide.

[24] FATF (2020). FATF Report to the G20 Finance Ministers and Central Bank Governors on So-Called Stablecoins. Paris: Financial Action Task Force (FATF). www.fatf-gafi.org/publications/virtualassets/documents/report-g20-so-called-stablecoins-june-2020.html.

[25] See https://restofworld.org/2021/stablecoins-find-a-use-case-in-africas-most-volatile-markets/.

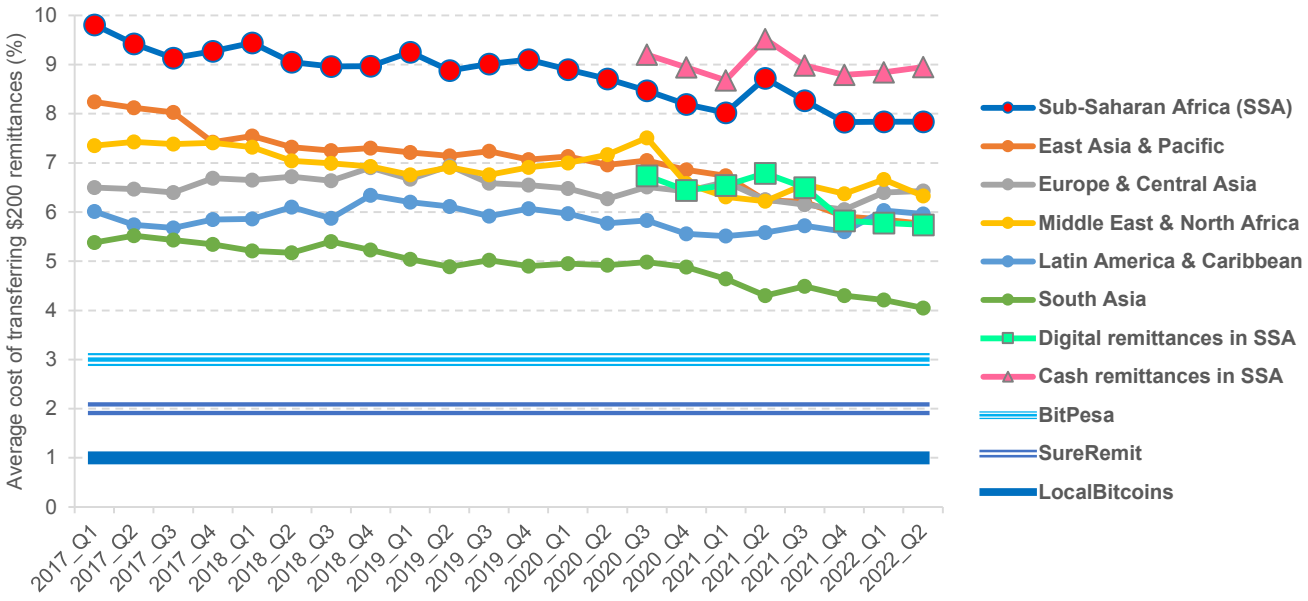
[26] See Ratha, D., Kim, E.J., Plaza, S., and Seshan, G. (2021). Resilience COVID-19 Crisis Through a Migration Lens. Migration and Development Brief 34. Washington, DC: KNOMAD-World Bank. https://www.knomad.org/publication/migration-and-development-brief-34; and Ratha, D., Kim, E.J., Plaza, S., Riordan, E.J., and Chandra, V. (2022). A War in a Pandemic: Implications of the Russian Invasion of Ukraine and the COVID-19 Crisis on Global Governance of Migration and Remittance Flows. Migration and Development Brief 36. Washington, DC: KNOMAD-World Bank. https://www.knomad.org/publication/migration-and-development-brief-36.

[27] World Bank (2022). Remittance Prices Worldwide Quarterly. Issue 42, June. https://remittanceprices.worldbank.org/sites/default/files/rpw_main_report_and_annex_q222.pdf

It is noteworthy that Sub-Saharan Africa showed the most significant and steady decreasing trend in remittance costs during the pandemic throughout 2020 (**Figure 3**). This is likely due to reductions in fees by remittances service providers, limited availability of more expensive and cash-based, in-person transfers and more adoption of digital channels in transferring remittances to the region. The cost of digital remittances in Sub-Saharan Africa was 5.7-6.8% (**Figure 3**) in Q3 2020 to Q2 2022, 2.1-3.2 percentage points lower than that of remittances in cash.

Cryptocurrencies have huge potential to further lower remittance costs to facilitate post-pandemic recovery. The transferring process can be either a direct cryptocurrency sending and receiving process or a process involving two fiat currencies with the cryptocurrency as a transfer currency: Fiat currency 1—cryptocurrency—Fiat currency 2. The peer-to-peer (P2P) nature of the cryptocurrency transfer process enables it to complete cross-border remittance transfers with much higher speeds (within hours, not several business days) and lower costs than traditional methods (e.g., through money transfer operators such as Western Union, MoneyGram and Ria Money Transfer). **Figure 3** shows the costs of several cryptocurrency-based remittance transfer instruments used in Africa (BitPesa, SureRemit and LocalBitcoins), which are typically below 3%. Kenya-based BitPesa allows users to send remittances using Bitcoin. Remittances in a fiat currency are first converted to Bitcoins on BitPesa, which transfers them to a designated mobile money account and then converts the money back into another fiat currency. The transaction is often completed within two hours, and the fee is about 3%.[28] Nigeria's SureRemit charges 0-2% for non-cash remittances. Stablecoins can take it further by offering the same low transaction costs while maintaining low price fluctuations to retain most of the users' monetary value. In Africa, cryptocurrency trading platforms such as Paxful, BuyCoins, Luno and Quidax have seen a surge in trading of stablecoins such as USDT and USDC, spurred by remittance transactions.[29]

Figure 3: Average costs of remittance inflows by region and instruments



Source: Remittance Prices Worldwide database, IFC and public news.[30]

Note: The cost values for cryptocurrency-based remittance transfers represent latest available values.

[28] International Finance Corporation (2019). Blockchain: Opportunities for Private Enterprises in Emerging Markets, Second Edition. Washington, DC: International Finance Corporation.

[29] See https://restofworld.org/2021/stablecoins-find-a-use-case-in-africas-most-volatile-markets/.

[30] Average costs of remittance inflows by region and costs of digital/cash remittances in SSA were from World Bank's Remittance Prices Worldwide database: https://remittanceprices.worldbank.org/resources. Transferring costs for BitPesa: International Finance Corporation (2019). Blockchain: Opportunities for Private Enterprises in Emerging Markets, Second Edition. Washington, DC: International Finance Corporation; SureRemit: https://news.bitcoin.com/crypto-based-transfers-can-cut-remittance-costs-in-africa-by-90/; and LocalBitcoins: https://forkast.news/cryptocurrencies-remittance-africa-blockchain-bitcoin-money-transfers-fees/.

In the humanitarian financing sector, cryptocurrencies, especially stablecoins, are playing a new role in support of cost-effective, cheap disbursements of aid. For instance, ImpactMarket, a Portugal-based decentralized poverty-alleviation organization, distributed an unconditional basic income to communities in Africa using a stablecoin Celo Dollar (CUSD) to avoid high banking fees.[31] Mercy Corps and the Binance's Blockchain Charity Foundation piloted a stablecoin token pegged to the Ugandan shilling in their cash transfer programming for 366 households of approximately 2,200 South Sudanese refugees and Ugandan micro-entrepreneur households in the Yumbe District, with reduced transaction costs and distribution time.[32] Outside of Africa, Binance made cryptocurrency donations of about $10 million equivalent for humanitarian emergency needs in Ukraine and neighboring countries in early 2022. The crypto donations include $2.5 million equivalent each to UNHCR and UNICEF for supporting their life-saving work for refugees and children.[33]

1.4 Offering alternative revenue options through taxation of cryptocurrency

Taxation is a sustainable and dominant source of public revenue that is needed for achieving the SDGs and implementing the Addis Ababa Action Agenda and the African Union's Agenda 2063. Recent revenue statistics show an average tax-to-GDP ratio of African countries of 16.6%, much lower than that of other regions around the world, 21–34% for Asian and Pacific economies, Latin America and the Caribbean, and the OECD.[34] The accelerating global development of the digital economy poses additional challenges such as tax evasion for tax revenue mobilization.

Similar to the swift growth of the global cryptocurrency market (**Figure 1**), the cryptocurrency value received in Africa is on a rapidly increasing trend, with a cumulative $106 billion between July 2020 and June 2021 and a rise by 1,200% in 2021.[35] According to the Chainalysis Global Crypto Adoption Index,[36] the region has countries like Kenya, Nigeria, South Africa and Tanzania among the global top 20 cryptocurrency adoption countries with high shares of cryptocurrency trading on P2P platforms.

Given the dynamic growth of the cryptocurrency market, the 2018 interim report of the OECD/G20 Inclusive Framework on Base Erosion and Profit Shifting (BEPS) recognized the importance of tax evasion and tax crime risks posed by cryptocurrencies.[37] There are potential losses of tax revenue from the cryptocurrency market, especially from large holders of cryptocurrencies and in countries with wide usage of cryptocurrencies. This offers opportunities for collecting additional tax revenue or recovering tax revenue from those who use cryptocurrencies for tax evasion and avoidance on purpose. In a recent study by OECD,[38] the tax treatments of cryptocurrencies in over 50 jurisdictions globally were reviewed across income, consumption and property taxes. Under income taxes, most countries consider cryptocurrencies as intangible property and tax cryptocurrency trading as capital gains and/or income tax. Under consumption taxes, the exchange of cryptocurrencies is not subject to value-added tax in almost all countries. And under property taxes, cryptocurrencies may be subject to wealth, inheritance and gift taxes, where these exist. Countries need to evaluate and decide based on their specific context whether to tax cryptocurrencies and what type and level of tax to apply to reach a balance between tax revenue mobilization/recovery and socio-economic inclusion through cryptocurrency.

[31] See https://restofworld.org/2021/stablecoins-find-a-use-case-in-africas-most-volatile-markets/.

[32] See https://medium.com/mercy-corps-technology-for-development/lessons-learned-from-field-trials-of-blockchain-enabled-vouchers-a8c7608f939c#_ftn1.

[33] See news from UNICEF, UNHCR and Binance: https://www.unicef.org/partnerships/binance-charity-supports-unicefs-efforts-help-children-ukraine; https://www.unrefugees.org/news/the-un-refugee-agency-accepts-first-stablecoin-crypto-donation-of-2-5m-from-binance-charity-to-support-ukraine-efforts/; and https://www.binance.charity/Ukraine-Emergency-Relief-Fund.

[34] OECD/AUC/ATAF (2021). Revenue Statistics in Africa 2021. Paris: OECD Publishing. https://doi.org/10.1787/c511aa1e-en-fr.

[35] Chainalysis (2021). The 2021 Geography of Cryptocurrency Report: A Deep Dive into Cryptocurrency Adoption and Usage around the Globe. https://go.chainalysis.com/2021-geography-of-crypto.html.

[36] Chainalysis (2021). The 2021 Geography of Cryptocurrency Report: A Deep Dive into Cryptocurrency Adoption and Usage around the Globe. https://go.chainalysis.com/2021-geography-of-crypto.html.

[37] OECD (2018). Tax Challenges Arising from Digitalisation—Interim Report 2018: Inclusive Framework on BEPS, OECD/G20 Base Erosion and Profit Shifting Project. Paris: OECD Publishing. https://dx.doi.org/10.1787/9789264293083-en.

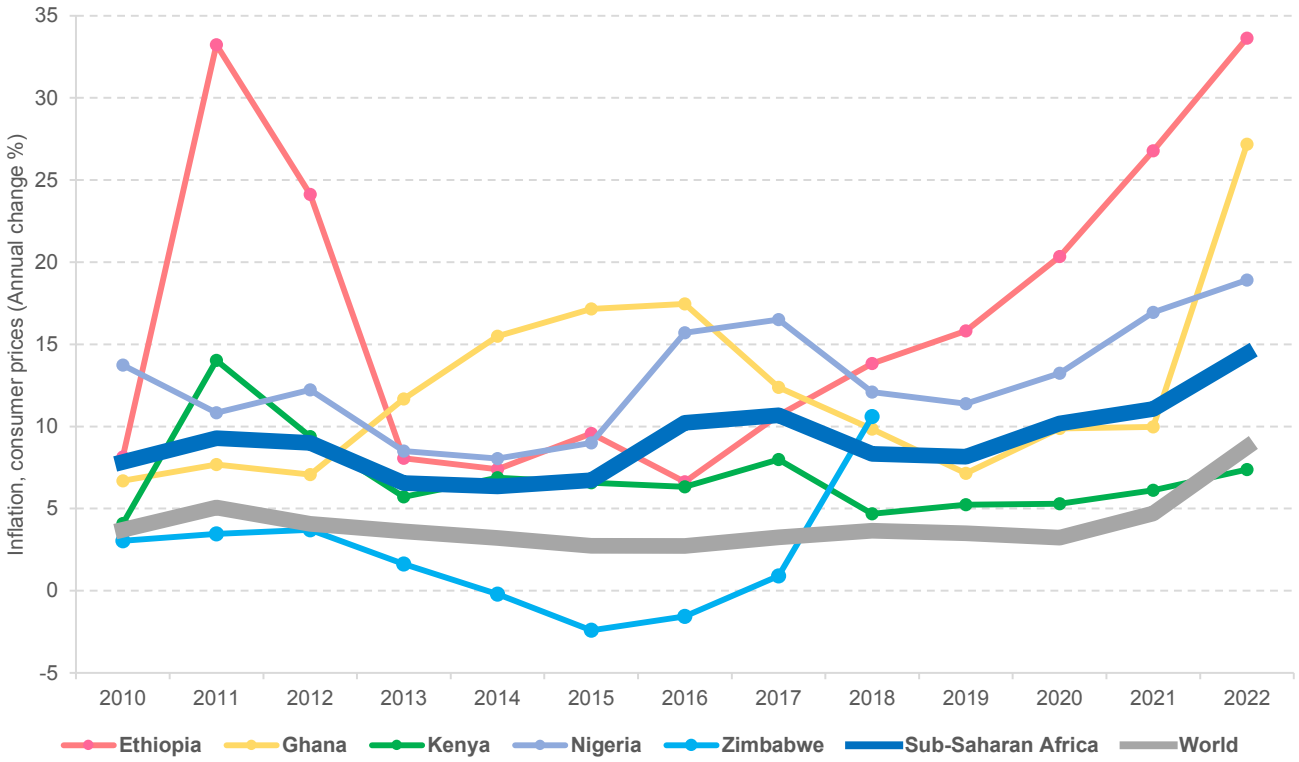
[38] OECD (2020). Taxing Virtual Currencies: An Overview of Tax Treatments and Emerging Tax Policy Issues. Paris: OECD. https://www.oecd.org/tax/tax-policy/taxing-virtual-currencies-an-overview-of-tax-treatments-and-emerging-tax-policy-issues.htm.

In Africa, many countries have not yet introduced tax policies and guidance on the taxation of cryptocurrencies in addressing the relevant tax evasion implications. South Africa, as an African pioneer in this legislative aspect, started its regulatory understanding of cryptocurrencies back in 2014, issued its stance on the tax treatment of cryptocurrencies in 2018 and released a position paper in 2020 specifying recommendations for developing a regulatory framework (including taxation) for cryptocurrencies.[39] Normal income tax rules apply to cryptocurrencies in South Africa, and affected taxpayers need to declare cryptocurrency gains or losses as part of their taxable income. The South African Revenue Services is legislatively granted collection powers through the Income Tax Act.

1.5 Protecting savings of households and businesses against rising inflation

Many African countries have a long history of much higher inflation rates than the global average (**Figure 4**). Countries such as Ethiopia, Ghana, Nigeria and Zimbabwe are known for having years of above-region-average levels of inflation. In addition to the inflation effects, many countries suffer from depreciation of their national currencies. The pandemic further worsens the situation. Overall consumer price inflation in Sub-Saharan Africa rose by three percentage points in 2021, spurred by supply disruptions and increased energy and food prices experienced since the beginning of the pandemic.[40] The war in Ukraine and sanctions on Russia are fuelling inflation further with soaring prices in food (e.g., wheat and corn) and energy.[41] The relatively high and still rising inflation threatens the wealth and purchasing power and thus the livelihoods of households in the SSA region, with a disproportionate impact on poor and vulnerable households.

Figure 4: Inflation rates in selected Sub-Saharan African countries



Source: IMF World Economic Outlook Database, October 2022.[42]

Note: Values for 2022 are estimates. Zimbabwe's inflation rates in 2019 to 2022 were too high (255%, 557%, 99%, and 285%, respectively) to plot in the figure.

[39] See South African Revenue Services (SARS) website: https://www.sars.gov.za/individuals/crypto-assets-tax/.

[40] Choi, S.M. (2021). Food Inflation in Sub-Saharan Africa. IMF blog: https://blogs.imf.org/2021/12/06/food-inflation-in-sub-saharan-africa/.

[41] Bogmans, C., Kearns, J., Pescatori, A., and Prifti, E. (2022). War-Fueled Surge in Food Prices to Hit Poorer Nations Hardest. IMF blog: https://www.imf.org/en/Blogs/Articles/2022/03/16/war-fueled-surge-in-food-prices-to-hit-poorer-nations-hardest.

[42] IMF World Economic Outlook Database, October 2022: https://www.imf.org/en/Publications/WEO/weo-database/2022/October.

Stablecoins that are pegged to a stable fiat currency and other cryptocurrencies that have digital scarcity based on disinflationary monetary models can offer some protective buffer against the negative effects of inflation. In Africa, some cryptocurrency trading platforms such as Binance, Buycoins and Luno offer stablecoins savings for African users who are trying to hedge against value loss of their local currency savings. These platforms also pay out interest on savings deposited as stablecoins (USDC, USDT or BUSD) or Bitcoin. In Nigeria, the platform Xend Finance, backed by Binance, offers options for credit unions, cooperatives and individuals to store their savings from local currency in dollar-backed stablecoins like USDC while earning interest in stable currencies like USD on their savings.[43]

1.6 Enabling innovative models for financing biodiversity

Africa's natural resource wealth holds the potential for bringing sustainable prosperity to its people, if the resources are sustainably and equitably harnessed. Besides the valuable land, oil and minerals, biodiversity assets such as the diverse plant and animal life and the marine ecosystems also bear important economic value. For instance, the carbon storage value of a single African forest elephant is $1.75 million.[44] However, the immature valuation of such nature assets, problematic contracting, illegal or opaque transactions and unfair mechanisms for distributing the benefits of nature assets limit the role of these assets in social and economic advancement and even threaten the sustainability of the assets.

Cryptocurrencies are increasingly being adopted by NGOs for receiving global donations to protect Africa's diverse natural ecosystems and support local communities. Donors may be incentivized to donate more when using cryptocurrencies to appropriately bypass the capital gains tax, which would be incurred in some jurisdictions when selling cryptocurrency into fiat currency for donation. The cryptocurrencies received by NGOs are typically converted quickly into fiat currencies to replenish the funds needed for biodiversity protection and community development, e.g., Marine Megafauna Foundation's project for scientific research on conservation of marine species along Mozambique's coastline and Space for Giants' wildlife conservation programmes in 11 Sub-Saharan countries.[45]

Other innovative models involve issuance of biodiversity asset-backed cryptocurrencies. In these models, cryptocurrencies are issued based on proof of biodiversity protection or proof of nature asset reserves. The issuances are built on permissioned private blockchains, which allow for a transparent, traceable and verifiable ledger. The proceeds from the cryptocurrency issuances are mainly used for conservation efforts and local communities' development. One example is the initiative of Rhino Coin issued upon proof of legal rhino horn reserves to boost rhino numbers in South Africa.[46] In another emerging initiative piloted in the Loango National Park of Gabon, Rebalance Earth crypto tokens are issued based on proof of forest elephant preservation and carbon offsets from elephants.[47] Although promising, the real impacts of these pioneering initiatives on strengthening biodiversity conservation are yet to be tested.

[43] See Xend Finance's website: https://xend.finance/.

[44] Chami, R., Fullenkamp, C., Cosimano, T., and Berzaghi F. (2020). The Secret Work of Elephants: African Forest Elephants Fight Climate Change by Contributing in Surprising Ways to Natural Carbon Capture. Finance & Development, December, 58-62. https://www.imf.org/external/pubs/ft/fandd/2020/12/pdf/how-african-elephants-fight-climate-change-ralph-chami.pdf.

[45] See Marine Megafauna Foundation at https://marinemegafauna.org/donate-with-crypto, and Space for Giants at https://www.spaceforgiants.org/crypto-for-conservation-give.

[46] See https://www.news24.com/Fin24/sa-cryptocurrency-launched-for-rhino-horn-trade-and-conservation-20180614 and https://www.itweb.co.za/content/kLgB17eJApQM59N4.

[47] See https://www.rebalance.earth/ and https://token.kitchen/biodiversity-tokens-rebalance-earth.

Pertinent uncertainties and risks

2

It is being increasingly recognized that cryptocurrencies, despite all the potential benefits, can also bear significant uncertainties and negative effects. The regulatory uncertainties and some key risks around cryptocurrency are highlighted below.

2.1 The regulatory uncertainty across Sub-Saharan Africa

Countries outside of Africa take different regulatory approaches towards cryptocurrencies. For example, China banned cryptocurrency trading and mining activities within the country in 2021.[48] In contrast with mainland China, Hong Kong, a special administrative region of China, takes a more open regulatory stance, as seen in its policy statement, issued in October 2022,[49] aiming to establish a consistent, predictable and clear regulatory framework and a facilitating environment for promoting sustainable and responsible development of the crypto sector in Hong Kong. US President Joe Biden issued an executive order in March 2022 outlining a policy approach for addressing the risks and harnessing the potential benefits of digital assets, including cryptocurrencies across six areas: consumer and investor protection, financial stability, illicit finance, international cooperation, financial inclusion and responsible innovation.[50] In September 2022, the US government released a framework composed of a series of reports for the responsible development of digital assets.[51]

Increasing interest in and application of cryptocurrencies have been seen in the Sub-Saharan Africa region, particularly in countries like Nigeria, South Africa, Kenya and Ghana. However, a lot of uncertainties remain regarding cryptocurrency regulations across the region. The policy approach to cryptocurrency varies in the region and is controversial and ever-changing, under the context of the growing digitalization trend accelerated by the pandemic.

Figure 5 gives a summary overview of the regulatory stances towards cryptocurrencies in Sub-Saharan Africa. Nearly 70% of the countries in the region currently take a neutral or uncertain policy approach to cryptocurrencies, i.e., no explicit position on accepting or rejecting cryptocurrencies and no regulation in place.

Countries[52] such as South Africa, Mauritius and the Central African Republic have taken a positive stance on cryptocurrencies. **South Africa**'s financial sector regulators have recently published a policy position paper on cryptocurrencies (named "crypto assets" in the paper) through the Intergovernmental Fintech Working Group (IFWG).[53] The IFWG paper provides specific recommendations on developing a regulatory framework for cryptocurrencies, including confirmation of cryptocurrency legal status and tax application along with regulatory framework implementation for AML/counter-terrorist financing (CFT), monitoring and analysis programme, licensing and supervision, cross-border regulation, payment system providers, initial coin offerings, use in alternative investment and cryptocurrency market support services. **Mauritius** is another regional frontrunner. With the ambition of positioning Mauritius as Africa's fintech hub, Mauritius's Economic Development Board has so far granted Regulatory Sandbox Licenses through its National Regulatory

[48] See https://www.coindesk.com/learn/china-crypto-bans-a-complete-history/.

[49] See the Policy Statement on Development of Virtual Assets in Hong Kong by the Financial Services and the Treasury Bureau of Hong Kong: https://www.info.gov.hk/gia/general/202210/31/P2022103000454.htm.

[50] See https://www.whitehouse.gov/briefing-room/presidential-actions/2022/03/09/executive-order-on-ensuring-responsible-development-of-digital-assets/.

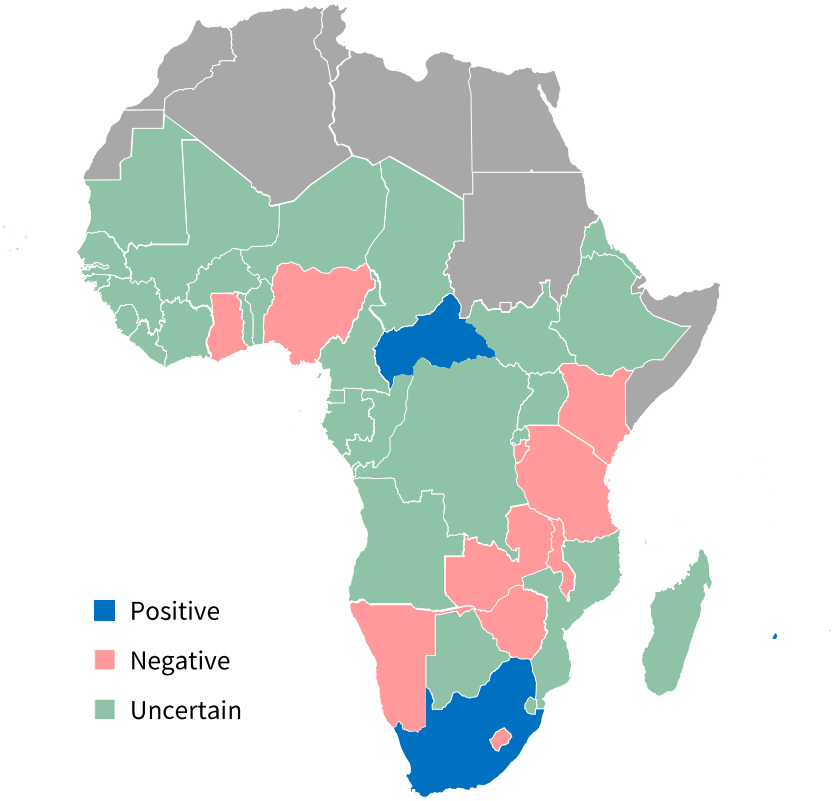
[51] See https://www.whitehouse.gov/briefing-room/statements-releases/2022/09/16/fact-sheet-white-house-releases-first-ever-comprehensive-framework-for-responsible-development-of-digital-assets/.

[52] Unless otherwise referenced, please see data sources in **Figure 5** when referring to country examples in the text under this subsection.

[53] South African Intergovernmental Fintech Working Group (IFWG), Crypto Assets Regulatory Working Group (2020). Position Paper on Crypto Assets (updated in 2021). https://www.sars.gov.za/wp-content/uploads/IFWG-CAR-WG-Position-paper-on-crypto-assets.pdf.

Sandbox License Committee to nine fintech companies, four of which are cryptocurrency companies.[54] More recently, in late April 2022, the **Central African Republic** (CAR) announced the adoption of Bitcoin as a legal tender and passed a law to govern cryptocurrency-related transactions in the country.[55] This law sets the initial legal framework to allow for cryptocurrency operations, such as conversion between cryptocurrencies and fiat currency and cryptocurrency payment for goods or services and even for taxes. Further, in July 2022, CAR launched its national crypto initiative, the Sango Project,[56] which includes, among others, the issuance of a national cryptocurrency, SANGO coin, built on a Layer 2 blockchain on top of the Bitcoin network. It is, however, not clear if the CAR government has conducted relevant feasibility research together with assessment of risks (including the key risks outlined below, 2.2 to 2.5) and mitigation measures in place in the country's specific context before the adoption of Bitcoin as a legal tender, enforcement of the new law and implementation of the Sango Project at a nationwide level.

Figure 5: Regulatory stance on cryptocurrency in Sub-Saharan African countries



Source: Baker McKenzie (2018), Law Library of Congress (2018), Reserve Bank of Zimbabwe (2021), Presidency of the Central African Republic (2022), Perkins Coie, and Proelium Law databases.[57]

Note: The indicated regulatory status is subject to change given fast-evolving policy stances in the region. The boundaries and any other information shown on the map do not imply, on the part of the UNDP or UNCDF, any judgment on the legal status of any territory or any endorsement or acceptance of such boundaries.

[54] Mauritius's Economic Development Board (EDB) issued Regulatory Sandbox Licences to FinTech companies for their innovative projects in 2019: https://www.edbmauritius.org/newsroom/edb-issues-regulatory-sandbox-licences-fintech-companies-their-innovative-projects.

[55] See Presidency of the Central African Republic (2022). Law n°22.004 of April 22, 2022 Governing Cryptocurrency in the Central African Republic: http://www.droit-afrique.com/uploads/RCA-Loi-2022-04-cryptomonnaie.pdf and https://bitcoin.fr/un-cadre-legal-pour-les-cryptomonnaies-en-centrafrique/.

[56] The Sango Project was started by the National Assembly and supported by the Presidential Office of Central African Republic. More details can be found in the Sango Project whitepaper https://sango.org/genesis-paper.pdf and on the web https://sango.org/.

[57] Compiled from Baker McKenzie (2018). Blockchain and Cryptocurrency in Africa: A Comparative Summary of the Reception and Regulation of Blockchain and Cryptocurrency in Africa: https://www.bakermckenzie.com/-/media/files/insight/publications/2019/02/report_blockchainandcryptocurrencyreg_feb2019.pdf; Law Library of Congress, Global Legal Research Center (2018). Regulation of Cryptocurrency Around the World: https://jolt.richmond.edu/files/2021/02/Bull_cryptocurrency-world-survey.pdf; Reserve Bank of Zimbabwe (2021). Fintech Regulatory Sandbox Guidelines: https://www.rbz.co.zw/documents/BLSS/Fintech/FINTECH-REGULATORY-SANDBOX-GUIDELINES.pdf; Presidency of the Central African Republic (2022). Law n°22.004 of April 22, 2022 Governing Cryptocurrency in the Central African Republic: http://www.droit-afrique.com/uploads/RCA-Loi-2022-04-cryptomonnaie.pdf and https://bitcoin.fr/un-cadre-legal-pour-les-cryptomonnaies-en-centrafrique/; Perkins Coie LLP (2021). Digital Currencies: International Actions and Regulations: https://www.perkinscoie.com/en/news-insights/digital-currencies-international-actions-and-regulations.html; and Proelium Law LLP's Cryptocurrency Regulation Tracker: https://proeliumlaw.com/cryptocurrency-regulation-tracker/.

Some other countries, however, take a hard stance towards cryptocurrencies. Zimbabwe recently explicitly excluded cryptocurrency, together with digital currency and central bank digital currency, as non-eligible products or services from its Fintech Regulatory Sandbox. The Bank of Namibia declared in its position paper on virtual currencies that trading of cryptocurrencies on any financial market or currency exchange is not allowed, and cryptocurrency cannot be accepted as payment for goods and services. In Nigeria, banking institutions are prohibited from dealing in cryptocurrencies or facilitating payments for cryptocurrency exchanges. The Central Bank of Lesotho bars the operations of individuals and entities that promote investment in cryptocurrency. Burundi's central bank warned the public that no entity or financial institution in the country is authorized to offer remittance services or other payment services using cryptocurrencies.

It is noteworthy that, regardless of their policy stance towards cryptocurrencies, many countries have issued notices to the public and advised caution regarding the risks associated with cryptocurrencies. But this alone may be far from enough to thoroughly address the key associated risks that are further examined below, especially in countries without any established risk-informed cryptocurrency regulatory framework.

2.2 Disintermediation and destabilizing impacts on the financial system

Cryptocurrencies can bring disintermediation and destabilizing challenges to the financial system. The banking sector may face increasing competition from the cryptocurrency ecosystem, and banks' positions as financial intermediaries may be weakened if the use of cryptocurrencies, especially stablecoins, as means of payment and store of value is increasingly gaining wider and more extensive adoption.[58] The growth of decentralized finance (DeFi) with use of cryptocurrency, especially stablecoins, in transactions can accelerate this disintermediation effect on the banking sector. As a new trend in the crypto-ecosystem, DeFi can offer various financial products and services involving cryptocurrencies, such as stablecoins, exchanges, interest-bearing credit and deposit, insurance, derivatives and asset management, similar to those of the traditional financial system.[59] But these are provided without the need for intermediaries and are implemented on public blockchains, primarily Ethereum, in an open, decentralized (peer-to-peer), pseudonymous, permissionless and autonomous way.[60]

The rapid progress of stablecoin adoption in emerging markets and developing economies also bears important implications for countries' own local currencies and monetary policies, especially for countries with high inflation and volatile exchange rates. In such countries, adoption of stablecoins backed by a stable foreign currency (e.g., US$) will likely weaken the local currencies in favor of the foreign currency backing the stablecoins. This can lead to enhanced "dollarization"[61] in those countries and undermine the countries' effective control over monetary policy, financial stability and economic growth.[62] If this adoption level rises to the global level, the financial stability risks may become systemically significant. One potential global stablecoin was the US$-based private stablecoin Diem (formerly known as Libra) proposed by Facebook and its multinational partners, which could potentially reach billions of users through Facebook's massive global social networks and platforms. In part because of major regulatory concerns, the Diem stablecoin initiative was shut down at the end of January 2022.[63]

[58] See IMF (2021). Global Financial Stability Report—COVID-19, Crypto, and Climate: Navigating Challenging Transitions. Washington, DC, October: https://www.imf.org/en/Publications/GFSR/Issues/2021/10/12/global-financial-stability-report-october-2021; and Adrian, T., and Mancini-Griffoli, T. (2019). Digital Currencies: The Rise of Stablecoins. IMF blog: https://blogs.imf.org/2019/09/19/digital-currencies-the-rise-of-stablecoins/.

[59] World Economic Forum (2021). Decentralized Finance: (DeFi) Policy-Maker Toolkit. https://www.weforum.org/whitepapers/decentralized-finance-defi-policy-maker-toolkit.

[60] OECD (2022). Why Decentralised Finance (DeFi) Matters and the Policy Implications. Paris: OECD. https://www.oecd.org/finance/why-decentralised-finance-defi-matters-and-the-policy-implications.htm.

[61] Dollarization refers to the de facto adoption of a foreign currency (not necessarily US$) or asset that displaces the domestic currency, driven by the preferences of residents. See IMF (2021). Global Financial Stability Report—COVID-19, Crypto, and Climate: Navigating Challenging Transitions. Washington, DC, October. https://www.imf.org/en/Publications/GFSR/Issues/2021/10/12/global-financial-stability-report-october-2021.

[62] See Foster, K., Blakstad, S., Gazi, S., and Bos, M. (2021). Digital Currencies and CBDC Impacts on Least Developed Countries (LDCs). The Dialogue on Global Digital Finance Governance Technical Paper 1.2, UNDP/UNCDF: http://dx.doi.org/10.2139/ssrn.3871301; and Adrian, T., and Mancini-Griffoli, T. (2019). Digital Currencies: The Rise of Stablecoins. IMF blog: https://blogs.imf.org/2019/09/19/digital-currencies-the-rise-of-stablecoins/.

[63] See Diem's website statement about the sale of the intellectual property and other assets related to Diem project: https://www.diem.com/en-us/.

As with the greater adoption, financial stability risks relevant to cryptocurrencies are also emerging in capital markets. According to new IMF research,[64] cryptocurrencies (Bitcoin and Tether USDT) and equity markets have become increasingly interconnected in terms of price volatility and returns across both developed and developing economies during episodes of market volatility since the onset of COVID-19. This growing interconnectivity observed between cryptocurrencies and capital markets makes it possible for the transmission of shocks that can destabilize financial markets. As a result, countries with widespread cryptocurrency adoption can be exposed to greater risks to financial stability.

Although the above macro-financial impact posed by cryptocurrencies is not yet material, African countries, particularly those with a relatively weak financial system, should stay aware of the evolving financial-stability relevant risks, given the rapid development of cryptocurrencies globally and in Africa.

2.3 Illicit financial flows

The pseudonymity of many cryptocurrencies, including stablecoins, together with their high potential for cross-border reach and swift trading among different cryptocurrencies, makes them prone to being used for illicit transactions such as money laundering, terrorism financing, tax evasion, financial scams and other crimes, without being linked back to the illicit activity.[65]

Cryptocurrency trading that happens through decentralized peer-to-peer transactions may not reveal any customer identity information, making it impossible to trace who controls the traded cryptocurrencies if illicit activity is involved. Even if the trading is done on centralized platforms, relevant crypto-service providers need not disclose their customers' identity information, nor must they perform KYC in customers' registrations. Moreover, the ability to trade rapidly among different cryptocurrencies enables multiple transactions of illicit funds in a short time to effectively hide the trail of funds. Further, if illicit transactions are cross-border, which is often the case, supervision and enforcement will be impossible without coordinated international regulatory collaboration. These underlying risks lead to examples such as the dark web hosting illicit transactions via cryptocurrencies, ransomware attacks demanding ransom in Bitcoin and "rug pull" scams in which cryptocurrency developers abandon a project at a DeFi platform and run away with investors' money.[66]

The Financial Action Task Force (FATF), the inter-governmental global money laundering and terrorist financing watchdog, issued updated recommendations in 2021 for national authorities and cryptocurrency service providers to apply its standards to mitigate AML/CFT risks associated with cryptocurrency activities, including advice that service providers immediately and securely obtain, hold and transmit required originator and beneficiary information when conducting cryptocurrency transfers.[67] The overall implementation of the recommendations, however, is still at an early stage.

2.4 Volatility in prices of cryptocurrencies

Non-stablecoin cryptocurrencies, such as Bitcoin (BTC), Ether (ETH), XRP coin, Dogecoin (DOGE), Shiba Token (SHIBA), SafCoin (SAF) and SureRemit (RMT), have highly volatile prices in real market operations. Their prices are very prone to other influencing factors, such as investor expectations and market sentiment. For instance, Bitcoin's long-term trend in price may be influenced to some extent by the fixed total supply

[64] Iyer, T. (2022). Cryptic Connections: Spillovers between Crypto and Equity Markets. IMF Global Financial Stability Notes, No 2022/001. https://www.imf.org/en/Publications/global-financial-stability-notes/Issues/2022/01/10/Cryptic-Connections-511776.

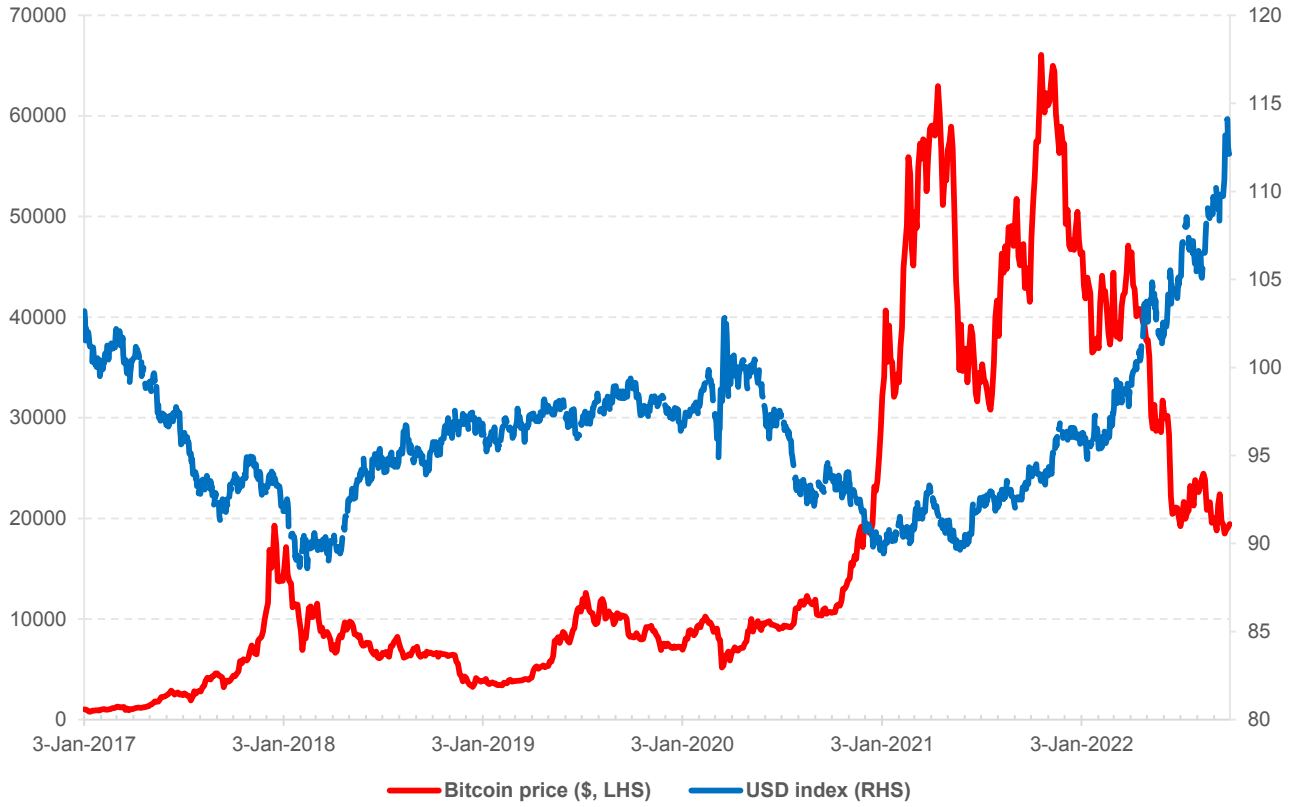
[65] See IMF (2021). Global Financial Stability Report—COVID-19, Crypto, and Climate: Navigating Challenging Transitions. Washington, DC, October. https://www.imf.org/en/Publications/GFSR/Issues/2021/10/12/global-financial-stability-report-october-2021; and He, D., Habermeier, K.F., Leckow, R.B., et al. (2016). Virtual Currencies and Beyond: Initial Considerations. IMF Staff Discussion Notes No. 16/3. https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2016/12/31/Virtual-Currencies-and-Beyond-Initial-Considerations-43618.

[66] See for the dark web: Lagarde, C. (2018). Addressing the Dark Side of the Crypto World. IMF blog: https://blogs.imf.org/2018/03/13/addressing-the-dark-side-of-the-crypto-world/; and Kumar, A., and Rosenbach, E. (2019). The Truth about the Dark Web. Finance & Development, September, 22-25: https://www.imf.org/external/pubs/ft/fandd/2019/09/the-truth-about-the-dark-web-kumar.htm; the 'Wannacry' ransomware attack: https://www.fatf-gafi.org/publications/virtualassets/documents/virtual-assets.html?hf=10&b=0&s=desc(fatf_releasedate); and Rug Pull scam: https://coinmarketcap.com/alexandria/glossary/rug-pull.

[67] FATF (2021). Updated Guidance for a Risk-Based Approach to Virtual Assets and Virtual Asset Service Providers. Paris: Financial Action Task Force (FATF). https://www.fatf-gafi.org/publications/fatfrecommendations/documents/guidance-rba-virtual-assets-2021.html.

of 21 million and the halving mechanism of Bitcoin mining rewards roughly every four years.[68] The price may experience an increase after each reward halving. Even though this pattern is generally followed, the Bitcoin price fluctuates significantly. The apparent negative correlation of Bitcoin prices with the USD index indicates that Bitcoin possesses the typical features of a risk asset rather than a safe-haven asset[69] (**Figure 6**). In particular, the Bitcoin price has experienced frequent and tremendous fluctuations since January 2021. For many other non-stablecoin cryptocurrencies, the price fluctuations could be considerably more significantly unpredictable.

Figure 6: Trends of Bitcoin price vs. USD index over time



Source: blockchain.com, yahoo finance databases as of 1 October 2022.[70]

A recent major risk affecting the prices lies in the provocative words of business leaders and celebrities that may distort market sentiment. For instance, significant price ups and downs were seen among cryptocurrencies in early 2021, largely as a result of Elon Musk's tweets about DOGE, SHIBA and BTC. Unexpected collapse events of big players in the crypto ecosystem can also cause market turbulence and panic and prompt wider drops in cryptocurrency prices. For example, both the crash of the algorithmic stablecoin TerraUSD (UST) and its sister token Luna in May 2022 and the meltdown of the cryptocurrency exchange FTX and its native token FTT in November 2022 spurred subsequent plunges in the prices of BTC, ETH and other major cryptocurrencies.[71]

[68] The total supply of Bitcoin is designed to be fixed at 21 million. A Bitcoin halving event is when the reward for mining Bitcoin transactions is cut in half, which also cuts in half Bitcoin's inflation rate and the rate at which new Bitcoins enter circulation. Bitcoin halving occurs roughly every four years. Three halvings happened in 2012, 2016 and 2020, with higher prices being seen after each halving. The implied theory is: bitcoin reward halved → half the inflation → lower available supply → higher demand → higher price.

[69] Safe-haven assets are those that tend to perform well in volatile and uncertain market environments, such as sovereign bonds in advanced economies, USD, gold, etc. The overall opposite price behaviour of Bitcoin against USD index, therefore, indicates the risk-asset nature of Bitcoin.

[70] Blockchain.com database for Bitcoin prices: https://www.blockchain.com/charts/market-price; and Yahoo Finance database for USD index: https://finance.yahoo.com/quote/DX-Y.NYB/history/.

[71] See Terra's crash at https://coinmarketcap.com/alexandria/article/are-algorithmic-stablecoins-dead-already-a-full-breakdown-of-the-terra-crash; and FTX's collapse at https://coinmarketcap.com/alexandria/article/glassnode-the-fall-of-ftx.

Another recent macro factor influencing the price of cryptocurrencies is closely related to the boom-bust cycle of global monetary policies. The world has been faced with tightening financial conditions since the end of 2021, as central banks, particularly the US Federal Reserve, increased interest rates to curb rising inflation.[72] Traditional financial asset prices have fallen, and financial market liquidity has worsened across asset classes as monetary policy has tightened.[73] In sync with this trend, big drops have also occurred in cryptocurrency prices and market caps (see **Figure 6** and **Figure 1**) under the same tightening financial conditions, consistent with the growing connectivity observed between cryptocurrencies and capital markets, as mentioned in 2.2.

2.5 Energy consumption and carbon emissions

Given the high energy consumption property of the underlying blockchain technology, emerging cryptocurrencies are likely to become energy and carbon-intensive in the near future if they are widely adopted and applied. Validating transactions on blockchains for Bitcoin and many other cryptocurrencies is done by the proof-of-work consensus algorithm or "mining" to solve a complex mathematical puzzle, which requires constantly expending and/or expanding computing power with increased energy consumption. The current annual energy consumption of the Bitcoin network is on the order of 100 terawatt-hours (TWh).[74] The energy consumption and carbon emissions associated with the mining of the cryptocurrency Bitcoin once grew rapidly in China. Had no proper policy interventions been implemented, in the example of China, the annual carbon emission output of the Bitcoin mining would have surpassed that of the Czech Republic and Qatar, according to a recent simulation study published in *Nature Communications*.[75]

Such impacts of energy consumption and carbon emissions can potentially spur domestic energy use and undermine the efforts in carbon emission reduction, especially in regions where the energy mix behind cryptocurrencies is dominated by fossil fuel sources rather than renewables and where the energy costs are subsidized. As shown in **Figure 7** , the global non-fossil fuel energy share of Bitcoin's underlying energy consumption varied between 34% and 60% during the period of September 2019 to January 2022. The decrease in the peak shares of non-fossil fuel consumption after May 2021 as compared to previous years can be largely explained by the full-scale clampdown on cryptocurrency mining and trading in China, where cryptocurrency miners could use hydropower during the wet seasons between May and October. China started its crackdown on cryptocurrency mining in May 2021, and its provincial governments immediately took proactive measures to eradicate mining activities.[76] Following this ban, cryptocurrency mining activity began migrating to other developing markets.[77]

There are ways to enable higher energy efficiency for cryptocurrencies. An alternative approach that is expected to be much less energy-intensive comes from the Ethereum blockchain, whose cryptocurrency Ether is the second largest after Bitcoin. Ethereum switched from a proof-of-work transaction validation mechanism to a more energy-efficient proof-of-stake mechanism on 15 September 2022. The proof-of-stake mechanism secures the Ethereum network by using the staked cryptocurrency Ether as collateral for validation rather than expended energy in heavy computation like in proof-of-work, with an estimated 99.99% reduction in annualized energy use.[78]

New research argues that the energy efficiency of cryptocurrency transactions under proof-of-work may be, in fact, as good as or better than the current monetary payment system. People often compare energy use in

[72] See Adrian, T., and Natalucci, F. (2022). Central Banks Hike Interest Rates in Sync to Tame Inflation Pressures. IMF blog. https://www.imf.org/en/Blogs/Articles/2022/08/10/central-banks-hike-interest-rates-in-sync-to-tame-inflation-pressures; and US Federal Funds rate hikes: https://tradingeconomics.com/united-states/interest-rate.

[73] Cortes, F., Gottselig, G., Ikarashi, S., and Yokoyama, A. (2022). Market Liquidity Strains Signal Heightened Global Financial Stability Risk. IMF blog. https://www.imf.org/en/Blogs/Articles/2022/10/26/market-liquidity-strains-signal-heightened-global-financial-stability-risk.

[74] See Cambridge Bitcoin Electricity Consumption Index (CBECI): https://ccaf.io/cbeci/index.

[75] Jiang, S., Li, Y., Lu, Q. Hong, Y., Guan, D., Xiong, Y., and Wang, S. (2021). Policy Assessments for the Carbon Emission Flows and Sustainability of Bitcoin Blockchain Operation in China. Nature Communications 12, 1938. https://doi.org/10.1038/s41467-021-22256-3.

[76] See https://www.coindesk.com/learn/china-crypto-bans-a-complete-history/.

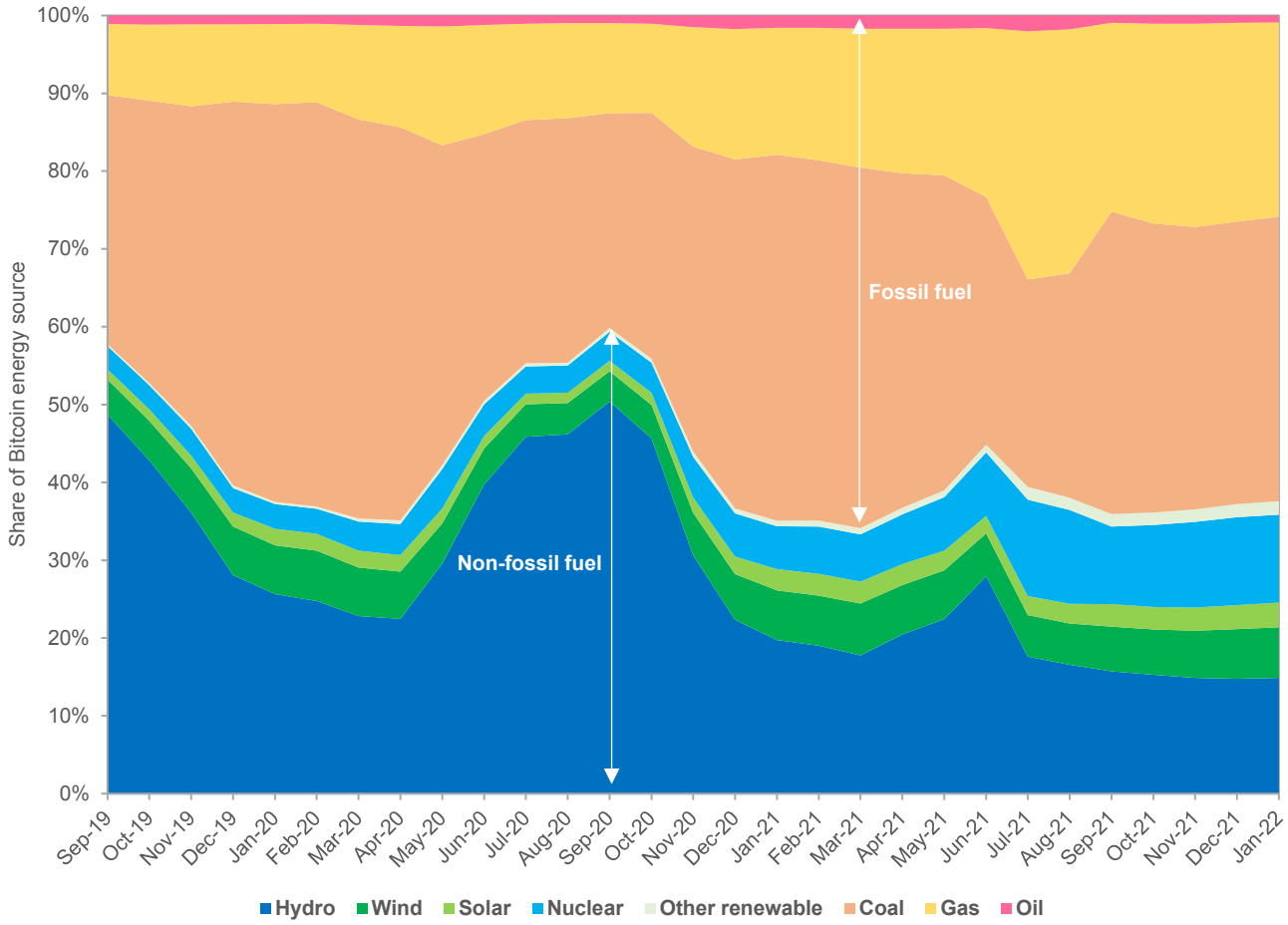
[77] See Bitcoin mining share evolution by country at the website of Cambridge Bitcoin Electricity Consumption Index: https://ccaf.io/cbeci/mining_map.

[78] See https://ethereum.org/en/energy-consumption/.

cryptocurrency transactions (such as Bitcoin and Ether) against VISA/Mastercard transactions. For example, a single Ether transaction in proof-of-stake is still equivalent to about 22 to 38 VISA/Mastercard transactions in terms of energy efficiency or carbon footprint.[79] Such a comparison, however, may be incomplete, as card payments are an intermediary step in the transaction while a Bitcoin/Ether transaction is final and covers end-to-end steps of the transaction. An alternative option is to compare the energy consumption of Bitcoin/Ethereum networks with all the aspects of the classical monetary payment system, including banknotes and coins issuance, cash management in ATM systems, card payments, point of sale (POS) payments, banking, and inter-banking energy consumption, etc. Accordingly, Bitcoin is estimated to use 28 times less energy than the classical banking system and produce equivalent or better energy efficiency at the single transaction level.[80]

In any case, countries may need to consider the potential energy and carbon impacts of cryptocurrencies based on their own domestic energy supply context.

Figure 7: Bitcoin network energy consumption by source in recent years



Source: Based on data from Cambridge Bitcoin Electricity Consumption Index.[81]

[79] Calculated based on data from https://digiconomist.net/ethereum-energy-consumption and https://ethereum.org/en/energy-consumption/.

[80] Khazzaka, M. (2022). Bitcoin: Cryptopayments Energy Efficiency. SSRN. https://ssrn.com/abstract=4125499.

[81] See Cambridge Bitcoin Electricity Consumption Index: https://ccaf.io/cbeci/ghg/index.

Policy recommendations

3

In implementing the Addis Ababa Action Agenda and achieving the 2030 Agenda for Sustainable Development, many African countries have started to develop integrated national financing frameworks (INFFs) for financing sustainable, resilient and inclusive national development.[82] As digitalization is increasingly seen in the African economies, digital finance will become an important chapter of the integrated financing strategies developed under INFFs.

Many countries on the continent have long been faced with challenges such as high population with inadequate and uneven financial coverage, inefficient and unmodernized payment systems, high cross-border transaction costs, high inflation and volatile currencies. The fast, cheap and accessible payment features of cryptocurrencies and the price stability of stablecoins, together with Africa's high mobile phone penetration, thus give rise to the recent rapid adoption of cryptocurrencies in Africa. Despite the potential merits for advancing the achievement of some SDGs, cryptocurrencies largely remain unregulated and bear non-negligible risks for financial and environmental impacts that warrant national authorities putting in place proper regulatory and supervisory frameworks for mitigation.

African policymakers could consider a number of recommendations to ensure that cryptocurrencies are adequately regulated and wisely used as innovative means to help advance sustainable development in their own specific domestic contexts.

- **Countries should improve investment in digital infrastructure, modernize payment systems, and enhance digital and financial literacy and risk education for citizens with gender equality, regardless of policy stances towards cryptocurrencies**. Continuous investment is needed in digital infrastructure such as optical fibre networks, optical ground wires, towers, cross-border links, data centers, data repositories and cloud computing providers, which help to strengthen internet connectivity and data storage and processing necessary for enhancing digital finance development in Africa. Efforts should also be made to modernize payment systems to offer fast, affordable, inclusive and transparent domestic and cross-border payment services. Different levels of digital and financial literacy and risk education, including on cryptocurrencies, should be provided with gender equality to citizens so that they will have improved capabilities to use both traditional and digitalized innovative financial products and services and be well aware of various types of financial risks.

- **National authorities need to consider prioritizing targeted implementation of existing global regulatory standards and recommendations on cryptocurrency put forth by international organizations and standard-setting bodies in the country-specific context, with coordinated mechanisms that allow for rapid review and adaptation to new developments of cryptocurrencies and their risks**. Such international standards[83] can be seen in the FATF's standards for mitigating the AML/CFT risks of cryptocurrency, the Bank for International Settlements (BIS) proposal for the prudential treatment of banks' crypto-exposures, the Financial Stability Board (FSB) recommendations on the regulation of global stablecoin arrangements and cryptocurrency activities and markets, and others.

[82] See more details about INFF at https://inff.org/region/africa; and Davis, E., Goni, O., and Beloe, T. (2020). From Crisis to Recovery: Building Back Better from COVID-19 through Integrated National Financing Frameworks and SDG Financing Strategies. In 'Dag Hammarskjöld Foundation and UN MPTF Office (2020): Financing the UN Development System: Time to Walk the Talk': https://www.daghammarskjold.se/publication/unds-2020/.

[83] See more details in: FATF (2021). Updated Guidance for a Risk-Based Approach to Virtual Assets and Virtual Asset Service Providers. Paris: Financial Action Task Force (FATF): https://www.fatf-gafi.org/publications/fatfrecommendations/documents/guidance-rba-virtual-assets-2021.html; Basel Committee on Banking Supervision (2021). Prudential Treatment of Cryptoasset Exposures. Basel: Bank for International Settlements (BIS): https://www.bis.org/bcbs/publ/d519.htm; FSB (2020). Regulation, Supervision and Oversight of 'Global Stablecoin' Arrangements. Basel: Financial Stability Board (FSB): https://www.fsb.org/2020/10/regulation-supervision-and-oversight-of-global-stablecoin-arrangements/; and FSB (2022). Regulation, Supervision and Oversight of Crypto-Asset Activities and Markets: Consultative Report. https://www.fsb.org/2022/10/regulation-supervision-and-oversight-of-crypto-asset-activities-and-markets-consultative-report/.

- **Further testing of the potential merits of cryptocurrencies, such as financial inclusion for different geographic, income and gender groups, fast and cheap payment, trade facilitation, biodiversity improvement, etc., can be carefully considered through pilots and experimentation in fintech-related regulatory sandboxes**. Regulatory sandboxes[84] provide a closely monitored and controlled small environment where crypto companies can test innovative financial products, services and business models with actual customers, while regulators can better understand the associated risks and benefits. Companies can be required to incorporate specific SDGs into their cryptocurrency business plans and models. In Sub-Saharan Africa, at least 10 countries have fintech-related regulatory sandboxes.[85] These countries can carefully consider pilot crypto projects in their existing sandboxes.[86] Other countries can learn from existing experiences to create their own regulatory sandboxes for cryptocurrencies.

- **Countries that need enhanced monetary policy control may assess and consider the issuance feasibility of central bank digital currencies (CBDC) with good payment systems to counter dollarization risks facilitated by increasing adoption of cryptocurrencies**. This needs to be coupled with institutional efforts in strengthening monetary policy credibility, reinforcing the central bank's independence, maintaining a sound fiscal position and implementing effective legal and regulatory measures to disincentivize foreign currency use and maintain use of national currencies.[87] Currently, CBDC pilots and research are active in seven Sub-Saharan countries.[88] Nigeria is the first African country that has fully launched its CBDC "eNaira" to the public.[89] Experience sharing and lesson learning among countries will be helpful in the feasibility assessment.

- **Establishing guidance and/or a legislative framework for taxation of cryptocurrencies can be considered after cost-benefit analysis in countries with rapid and wide cryptocurrency adoption**. The guidance or framework, if introduced, needs to provide clear information for taxpayers on how cryptocurrencies fit into the existing tax framework and in which taxable events they will be taxed as income, capital gains, consumption or property assets. Regular and frequent review of the guidance or tax framework may be needed, given the speed at which cryptocurrencies are evolving. The taxation treatment of cryptocurrencies may also need to be consistent with other regulatory frameworks for cryptocurrencies, such as those in the second recommendation above.

- **Appropriate policy frameworks can be considered regarding energy and carbon aspects of cryptocurrency mining, especially in countries with a fossil-fuel-dominated energy mix and subsidized energy costs**. Although cryptocurrency mining in Africa is limited so far due to factors such as high electricity prices and unstable electricity supply, Africa holds potential for crypto mining given its abundant renewable resources of solar, wind and hydropower. The total phaseout of mining activity from China will lead to increased mining shares of other countries, likely including Africa in the future. Some potential policy instruments for African countries to consider may include: (1) raising the market access standard for cryptocurrency mining's energy efficiency and restricting mining activity of low energy efficiency, (2) increasing the usage of surplus renewables (hydro, solar and wind) in the energy mix for cryptocurrency mining (coordinated with energy usage for other economic and social sectors) and (3) imposing or increasing carbon taxation on cryptocurrency mining.

[84] Arner, D.W., Buckley, R.P., Charamba, K., Zetzsche, D.A., and Sergeev, A. (2021). A Principles-Based Approach to the Governance of BigFintechs. Dialogue on Global Digital Finance Governance Technical Paper 3.3, UNDP/UNCDF. http://dx.doi.org/10.2139/ssrn.3975099.

[85] See 10 SSA countries (Eswatini, Kenya, Mauritius, Mozambique, Nigeria, Rwanda, Sierra Leone, South Africa, Uganda, and Zimbabwe) from: World Bank (2020). Global Experiences from Regulatory Sandboxes. Fintech Note, No. 8. Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/34789; Bank of Uganda (2021). Bank of Uganda Launches a Regulatory Sandbox Framework: https://www.bou.or.ug/bou/bouwebsite/bouwebsitecontent/MediaCenter/press_releases/2021/Jun/BoU-Launches-a-Regulatory-Sandbox-Framework.pdf; and Reserve Bank of Zimbabwe (2021). Fintech Regulatory Sandbox Guidelines: https://www.rbz.co.zw/documents/BLSS/Fintech/FINTECH-REGULATORY-SANDBOX-GUIDELINES.pdf

[86] Mauritius has introduced cryptocurrency projects in its fintech regulatory sandbox, while Zimbabwe excluded cryptocurrency from its sandbox (see subsection 2.1).

[87] IMF (2021). Global Financial Stability Report—COVID-19, Crypto, and Climate: Navigating Challenging Transitions. Washington, DC, October. https://www.imf.org/en/Publications/GFSR/Issues/2021/10/12/global-financial-stability-report-october-2021.

[88] These CBDC countries are Eswatini, Ghana, Kenya, Madagascar, Mauritius, Nigeria, and South Africa. See more detail in: Auer, R., Cornelli, G., and Frost, J. (2020). Rise of the Central Bank Digital Currencies: Drivers, Approaches and Technologies. BIS working paper, No 880, August (Updated in July 2022). https://www.bis.org/publ/work880.htm.

[89] Ree, J. (2021). Five Observations on Nigeria's Central Bank Digital Currency. IMF Country Focus. https://www.imf.org/en/News/Articles/2021/11/15/na111621-five-observations-on-nigerias-central-bank-digital-currency.

Building on the UN Secretary-General's Task Force on Digital Financing of the SDGs and the Dialogue on Global Digital Finance,[90] UNDP and UNCDF will work closely with central banks, finance, trade and other relevant ministries, cross-sector regulatory bodies and non-state actors from developing countries along with key international institutions such as FATF, FSB, BIS, IMF, World Bank, Global Partnership for Financial Inclusion–affiliated entities and other members of the international regulatory community in support of developing risk-based regulatory approaches and frameworks to cryptocurrency and broader digital finance for Africa and beyond. Improved SDG considerations will be aimed at incorporation in the development of regulatory frameworks. South-South and Triangular Cooperation approaches will be taken and partnership-fostering across countries will be promoted by UNDP and UNCDF to provide technical assistance and policy advisory support on cryptocurrency and digital finance as a trusted knowledge broker, partnership facilitator and capacity development supporter.

[90]See websites https://www.un.org/en/digital-financing-taskforce and https://sdgfinance.undp.org/digital-finance.

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