

CHAPTER 12

Harnessing the potential of digital finance for financing sustainable development

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1 INTRODUCTION

Many emerging and ‘frontier’ markets are leading the way in the new world of digital finance. Companies at the forefront of innovation in these markets are experiencing higher acceptance of their new approaches, as well as tolerant regulators who see them as a potential remedy to enhance financial inclusion in the face of a low penetration of traditional banking and insurance solutions. Limited capital market and financial services infrastructure makes these markets fertile ground for digital finance innovation. Digital technologies – including artificial intelligence (AI), distributed ledger technologies (DLT) and the internet of things (IoT) – are particularly well suited to address the barriers specific to emerging markets to scaling up finance for sustainable infrastructure and other critical areas of development. The core capabilities of digital finance can enable emerging markets to reinvent how capital market infrastructure and instruments are built to be responsive to the specific financing needs of companies in emerging markets, as well as the needs of the local investor base.

Most companies in emerging markets are family-owned SMEs, including small farming businesses, which are often only able to present patchy or incomplete financial data, but also need a historical track record to raise finance. At the same time, many citizens capable of micro-investing or emerging institutional investors are searching for different asset classes to allocate capital. Embedding technology into the fabric of capital markets allows for the design of both infrastructure and capital market instruments that respond well to the structures of many emerging and frontier economies. In economies in need of capital market infrastructure, there is a strong case for allowing listing requirements to be open to smaller issuers at low costs and enabling efficient aggregation of millions of micro-investors in a simple and accessible online user experience. Furthermore, data service providers that are active in capital markets can play a role in aiding institutional investors to mitigate the perceived high investment risks in these markets by leveraging

cutting-edge technologies, such as earth observation data, to enhance information and add a track record to relevant assets, and for retail customers to inform risk profiles and investment strategies.

However, various challenges may arise when embarking on using digital technology to reinvent financial market design processes in emerging markets that tend to have weaker governance and lower institutional capacity to regulate the digital finance solutions, which can lead to consumer protection risks, concentration of power in a few large platforms, data privacy and cyber security risks and more.

This chapter highlights the opportunities as well as the risks of digital finance in mobilising capital to support sustainable development in emerging markets. Section 2 will discuss opportunities for digital approaches to leverage sustainable finance by enlarging the investor base through digital capital market infrastructure and digital bonds, by increasing the supply of green and transition assets through digital data and asset aggregation, and by building a historical track record of retail customers and assets to unlock green finance. Section 3 will discuss risks and challenges. The final section will conclude.

2 OPPORTUNITIES FOR DIGITAL APPROACHES TO SCALE UP SUSTAINABLE FINANCE

Building financial market infrastructure in an environment where digital technologies are maturing, with some ready to move from prototypes to scaled solutions, offers emerging markets an opportunity to not just emulate and copy the financial market design of advanced markets, which in most cases also relies on an established legacy financial system, but to leapfrog into a system design that is digitally enabled and responding to the financing needs of their economies. This section focuses on three of the numerous possible avenues to leverage digital technologies to redesign financial market infrastructure and instruments to scale up sustainable finance in emerging markets.

2.1 Enlarging the investor base through digital capital market infrastructure and digital bonds

Given the urgent need to scale up investments in sustainable infrastructure to foster a low-carbon transition, many countries with underdeveloped capital markets face significant challenges mobilising domestic resources for infrastructure investment. Without innovative fundraising approaches, emerging markets stand to face significant challenges achieving their own sustainable transition efforts. Italy's inaugural green bond issuance in 2021 was larger than all emerging market sovereign green bond issuances in 2020. At the same time, the UK has installed more capacity of solar photovoltaics than the entire continent of Africa. Local capital will have to play a bigger role in closing the

financing gap for sustainable infrastructure to meet the Sustainable Development Goals (SDGs) and stay on a path to net zero by 2050 that is estimated to amount to roughly \$2.6 trillion annually through 2030 (Donovan 2021).

In many emerging markets, a ‘mobile first’ approach can be observed, under which access for consumers as well as SMEs to capital markets can naturally happen through a mobile interface, with assets stored in a digital wallet. In contrast, many people in advanced economies and markets still have to build confidence in using these practices that are often widely used in emerging markets. A digital wallet (a financial transaction application that runs on mobile devices, securely storing payment information and passwords) is a tool that plays a key role in unlocking greater access to capital, borrowing, investment and insurance. Furthermore, the low levels of credit card penetration in emerging markets have paved the way for the adoption of digital wallets as the primary avenue for people to financially connect. About 1.4 billion adults are unbanked (World Bank 2021), but approximately 84% of the world’s population has a smartphone and 92% of people own mobile phones today.¹ This far-reaching dissemination of mobile phones highlights the opportunity for the 1.4 billion unbanked people with mobile phone ownership to place even small amounts of savings into the most secure asset class in the world, namely, government securities, if supply is available.

Building on this digital financial infrastructure, first service providers, often supported or even initiated by central banks, have started to develop approaches using mobile phones to provide investment opportunities in capital markets for people who previously had neither the means nor the expertise and access to invest in securities. Most famously, the Government of Kenya (under the National Treasury, administered through the Central Bank of Kenya) launched the M-Akiba project to raise funding for infrastructure projects by issuing retail bonds that could be bought by small-scale individual investors on their mobile phone.² In 2017, the first M-Akiba (which means ‘M-Savings’ in English) bond raised KSh247 million (US\$2.47 million). In 2022, the Central Bank of Kenya launched a new and more user-friendly M-Akiba platform (Okoth 2022). In a similar project called Treasury Mobile Direct,³ the central bank allowed users in 2020 to buy treasury bills and bonds on their phone.

More recently, having explored the technological feasibility of green bond tokenisation, a use case has been developed by the Bank for International Settlements (BIS) Innovation Hub in Hong Kong in collaboration with the Hong Kong Monetary Authority (HKMA). This was done with the aim to concept test a government-issued digital asset for the retail market in Hong Kong to improve investor participation by streamlining the bond issuance and lifecycle process while allowing a smaller minimum allocation size. The developed prototype enabled the issuance of assets directly to the retail market. It also

1 Source: <https://www.bankmycell.com/blog/how-many-phones-are-in-the-world>

2 <https://www.treasury.go.ke/916-2/>

3 <https://www.centralbank.go.ke/tmd/>

tested the processes for direct secondary market exchanges among retail investors, utilising the underlying ledger infrastructure to introduce greater liquidity for retail green bond investors (BIS Innovation Hub 2021a).

Chen and Volz (2022) have proposed blockchain-based project bonds as an asset to raise finance through a digital crowdfunding platform, which is also able to transparently record and certify the use of proceeds, sustainability impact and the revenue streams of projects. This approach would introduce a project management tool, provide investors with the opportunity to purchase local-currency assets, and enable issuers to raise funds for sustainable infrastructure investment. Monetary and financial authorities, as well as national and multilateral development banks, can play a key role in supporting or even instigating these initiatives and in then further developing and scaling these approaches to complement conventional capital markets and mobilise financial resources for sustainable infrastructure investments.

Emerging markets can build on the lessons learned from these prototype projects in order to create the regulatory framework to encourage and supervise the tokenisation of bonds and shares to unlock the local investor potential of the broader population. Today, 85% of the world's population would have to save for more than two years to be able to afford a share in each of the top five market capitalisation companies (Tummala et al. 2020). Government securities are equally inaccessible to the 1.4 billion unbanked, as well as to lower-income groups in jurisdictions with minimum investment requirements (World Bank 2021). In many jurisdictions, the investment process can also be daunting and too complex for many to engage, contributing to the barriers that prevent citizens in emerging markets from investing in green assets.

Against this background, the tokenisation of bonds and shares can enable citizens in emerging markets to become investors with smaller amounts of savings and via digital aggregation of these micro-investments to raise additional sustainable investment capital. This would not only have the added benefit of unlocking more local currency capital, but it would also diversify the investor base from mainly foreign to also local. In addition, this helps to shift accountability and interest payments from exclusively being a relationship between the government (for government securities) and foreign creditors to also becoming a relationship between the government and the national population.

Furthermore, central bank digital currencies (CBDCs) are emerging as key elements of the digital financial infrastructure needed to enable the design of the capital market infrastructure and instruments that can enable the launch of tokenised bonds and fractionalised shares. CBDCs can enable the end-to-end digitisation of a green (or other sustainable) bond, including for payments and settlement on-chain. In addition, CBDCs can play a role in facilitating remittance flows to unlock additional sustainable investment capital (Dikau et al. 2022).

2.2 Increasing the supply of green and transition assets through digital data and asset aggregation

A global comparison of the availability of capital with the quantity of investable projects available living up to capital market requirements highlights a mismatch between an abundance of capital and a lack of sufficiently large and mature green projects, especially in emerging market economies. This supply-and-demand imbalance can act as an important barrier to scaling up green financing and investment in emerging market economies. Digital technology can be leveraged to innovate additional pathways to loan pipeline development, focusing on leveraging digital data to unlock access to green and transition finance for SMEs and smaller assets, which tend to make up the bulk of assets in emerging economies. In Africa, SMEs provide an estimated 80% of jobs across the continent (Runde et al. 2021), while in the Asia-Pacific region, MSMEs comprise 97% of all enterprises and employ 69% of the total workforce (ADB 2020).

According to a recent SME Climate Hub survey, SMEs are already making efforts to cut their greenhouse gas emissions (Jouven and Schmidt 2022). However, only 60% of SMEs have a long-term emissions reduction plan in place. The most common barrier to climate action by SMEs is a lack of resources, with 68% of surveyed businesses citing it as a concern. The lacking resources can be personnel, knowledge, or time to dedicate to the issue. The second-most common reason cited is lack of funding (Jouven and Schmidt 2022).

Digital technologies hold the potential to innovate in the mitigation of this financing gap by reducing transaction costs of SME carbon accounting, thereby enabling the structuring of green or green-transition SME credit. To enable this shift, it is key for banks and financial technology companies to start digitising carbon- and environment-related SME data points as part of the credit assessments process. In jurisdictions with open banking infrastructures and carbon inventory data, SME emissions accounting is already conducted using automated approaches for SMEs. A combination of transaction data available through open banking application program interfaces (APIs) and carbon inventory data has given rise to new digital solutions based on algorithms that can directly assess SME expenditure data from banks. With these data, it is possible to automatically classify every purchase of goods from a sector based on supplier codes and to finally automatically ascribe a carbon footprint based on the size of the purchases and the sector's emission averages.

These technology-enabled solutions can allow SMEs to access the carbon footprint of their operations and, at the same time, offer banks the data needed to design SME loans that link interest rate rebates to carbon reductions or to significant contributions to climate change mitigation or adaptation. Furthermore, these data sets can enable banks to identify patterns, provide businesses with actionable insights on how to transition to carbon-lighter expenditures, and identify the exposure to carbon-intensive business practices and the associated financial risks. Currently, the transaction data made

available by open banking are based on merchant codes, and not available for specific items purchased on online platforms or in shops. If open banking was to offer businesses an opportunity to share more granular (product-level) transaction data, then automated business carbon (and eventually also nature) footprints would become more accurate, based on real behaviours rather than on modelled sector averages. This would also enable banks to offer more precise and granular advice on transition pathways.

If this kind of product-level digital carbon inventory data are made available, it could also be leveraged by banks to aggregate SMEs with similar green transition needs for the issuance of digital SME climate transition bonds. A digital bond could be linked to changes in, for instance, transitioning the energy mix of SMEs, with the use of proceeds tied to, for example, solar installations or the electrification of transport fleets. The application of DLT to transition bonds could also enable issuance in various sizes. For DLT-issued bonds, there would be no difference in costs between a \$10 investment and a \$10 million investment (SDFA and HSBC 2019), enabling capital market instruments to better respond to the needs of emerging and frontier markets, where most green projects and assets are too small for traditional bond issuances.

2.3 Building a historical track record of retail customers and assets to unlock green finance

Credit to small-scale farmers and retail customers in emerging markets was for decades perceived as high risk and associated with high transaction costs by the incumbent financial services industry. Digital automation has already significantly reduced the transaction cost of financial services by allowing firms to harness economies of scale that make financial inclusion a profitable endeavour, rather than a regulatory requirement to be met (Knaack and Volz 2022). Non-banks, including mobile network operators and BigTech, appear to have done much more to foster financial inclusion over the past decade than traditional financial services providers by extending financial services through extensive agent networks and affordable mobile phones, exploiting platform economics, artificial intelligence and big data analytics in ways that traditional providers cannot (Osafo-Kwaako 2018).⁴

A next step for scaling up investments in green and transition finance in emerging markets could lie in leveraging digital technologies to create a track record covering the historical operations of firms and adding this background information on firms' underlying operations to the related assets. For example, earth observation and sensor data can be used for this process. The lack of a historical track record of most firms and the related assets, including yields and productivity of small-scale farmers, means that commercial lending or investment options are seldom available due to high perceived and real risks increasing the cost of capital. Concerning small-scale farmers, for example, the financial

4 See also the discussion on inclusive digital finance by Knaack and Volz (2022) in this book.

sector meets less than 3% of total smallholder demand for financing, which is estimated to amount to \$450 billion (Hong and Hanson 2016). Earth observation and sensor technologies hold great potential to deliver data inputs and inform the credit assessments of farmers, taking into account historical exposure to climate risks stemming from droughts and floods, the risk forecasting and the assessment of business plans relating to farm patterns of yield and productivity. The use of earth observation technologies has already been adopted by ‘insuretech’ (insurance technology) companies, enabling them to offer insurance products such as weather index insurance. Index insurance services require historical datasets to create and operationally run indices. However, limited weather station coverage across emerging and developing countries means that rural weather data are often unavailable, causing problems for risk models that require at least ten years’ of data from the monitoring source. The increasing affordability and accessibility of satellite data have resulted in better coverage, more extensive historical data and access to near real-time weather data (GSMA 2020). This has also empowered farmers with data on their climate-related risk exposure and insurance options to increase resilience in the face of this risk. Emerging markets can further strengthen capabilities in the financial and fintech sector to leverage a mix of satellite imagery, AI, the IoT and big data analytics to leapfrog the building up of historical data sets by enabling the use of technology to engineer a missing historical track record of firms’ activities. Some of these datasets are made publicly available through the EU Copernicus open source satellite data by the European Space Agency (ESA) as well as the NASA Landsat datasets of the US, but also datasets from Google Earth Engine.

3 RISKS AND CHALLENGE

Digital finance can be associated with its own problems and challenges, ranging from weak and vulnerable digital infrastructure, the limited robustness of systems, data protection issues, and the use for fraudulent activities, to the adverse environmental impacts of technology and digitisation (e.g. energy use of cloud computing and environmental impact of critical minerals, including rare earth mining and processing). Furthermore, in emerging market and developing economies where digital banks have fertile ground to rapidly scale up their operations, risks for financial stability become relevant, with potential systemic implications. These so-called ‘neobanks’ that operate exclusively online without traditional physical branch networks are exposed to risks stemming from their traditionally uncollateralised consumer lending business, which tends to be vulnerable to losses due to limited buffers.

Furthermore, cryptocurrencies are increasingly recognised as speculative assets that, in many cases, are used to facilitate money laundering, ransomware attacks and other financial crimes. Bitcoin in particular has been subject to public and regulatory scrutiny, resulting in criticism for the lack of public interest attributes, as well as criticism of its wasteful energy footprint (BIS 2021). CBDCs are emerging in response to these shortcomings as they provide a safe and public digital financial infrastructure that also

has the potential to enhance sustainable digital finance. While the potential of CBDCs to increase and support financial inclusion and facilitate international payments has already been explored (BIS Innovation Hub 2021b, BIS, 2022), the potentially important role of CBDCs in contributing to scaling up green finance remains under-researched.

Furthermore, addressing limited financial and digital inclusion is a major obstacle not only to reducing vulnerabilities and creating opportunities through microfinance and insurance, but also to scaling up sustainable finance. There is still a significant usage gap of 3.2 billion people in 2021, or 41% of the global population, relating to a lack of affordability, relevance, knowledge and skills, in addition to safety and security concerns. Digitisation can be a key lever in addressing financial inclusion, with operators' investments in network infrastructure over the last decade having helped to shrink the coverage gap for mobile broadband networks from a third of the global population to just 6% (GSMA 2022).

These challenges will have to be addressed to leverage digital capabilities to scale up sustainable finance. Emerging market central banks, supervisors and policymakers can play a critical role in supporting the development of digital sustainable finance infrastructures. While for some, the challenges lie in having to mitigate possible unintended consequences and risks of digitisation to consumer protection and financial stability, others play a foundational enabling role and are dealing with basic infrastructure and financial or digital inclusion-related challenges reflected in an underdeveloped digital infrastructure.

4 CONCLUDING REMARKS

Emerging markets have the opportunity to leverage digital technology to make banking and capital markets fit to deliver on the sustainable financing needs of their economies. Market readiness to pursue the three described avenues towards capital market innovation varies across jurisdictions, depending on coverage of mobile connectivity, regulatory and supervisory capabilities and frameworks, and capacity of the financial services sector to manage tech-driven capital market development processes. However, emerging market regulators and policymakers can play a role in assessing and building the tech-enabled financial market architecture best suited to support the sustainable financing needs of the economy, thereby also outlining the required combination of technologies and data. The pathway to implementing digital sustainable finance solutions can be formalised as part of a roadmap, which could either follow an 'all-in' approach under which all digital components are built at once or a 'step-by-step' approach that envisions one or more modules being implemented over time.

Many emerging market jurisdictions already implement one or more of the approaches described above, or at least different components of them. For instance, open banking, as an enabler of access for SMEs to green finance through automated SME carbon accounting, is either being proposed or rolled out across emerging markets. Even though it

is not necessarily happening with a green finance objective, sustainability could be added later into the established open banking roadmap. In Africa, open banking is part of the recent Kenyan payment directive, and the Nigeria central bank has issued open banking guidelines. In these two jurisdictions, less emphasis is given to access to accounts; instead, a greater focus lies on open APIs that allow the integration of mobile money networks and financial institutions. However, both approaches offer the opportunity to link transaction and carbon emission data. Getting the infrastructure ready for capital markets to link these data sets will be key to unlocking the discussed potential, which is something regulators and policymakers can strategically work towards. Bringing this explicit sustainability perspective into capital market digitisation strategies will have to be a next step for emerging markets in order to leapfrog advanced economies by aligning financial market architecture with the sustainable financing needs of local economies.

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